MAY 31 1917
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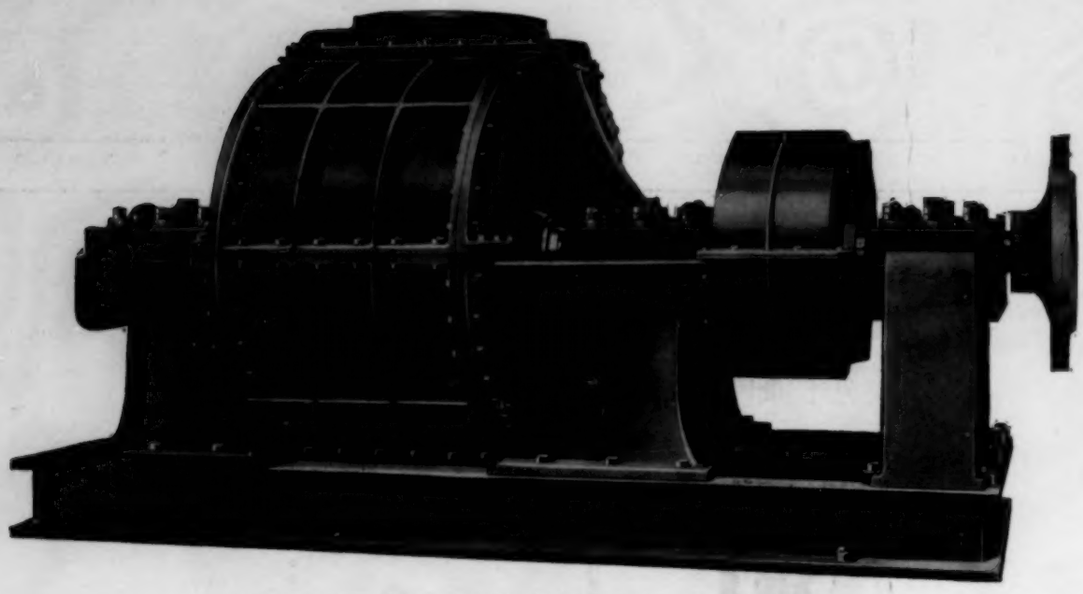

Connersville High Pressure Gas Pump

CONNERSVILLE

Gas Pumps, Exhausters and Boosters

CONNERSVILLE GAS PUMPS, EXHAUSTERS and BOOSTERS are exceptionally advantageous wherever gas is handled.

Altho they are the type of simplicity, they possess all the features of practical construction, resulting from years of experience.

CORRECT

The testimonials which we have received from users of CONNERSVILLE PUMPS, EXHAUSTERS and BOOSTERS, prove that "Connersville" products are correct both in design and service. Many state that they out-work as well as out-last the best pumps that they have ever been able to obtain.

EFFICIENT

Their range of capacity is from 25 to 40,000 cu. ft. per minute, and their pressure range is from ½ to 10 pounds. There is no lost motion—all motion is rotary, parts being carefully balanced and separated by accurately gauged clearances. There are no valves, no springs and no internal parts requiring lubrication.

SERVICEABLE

The service to which CONNERSVILLE PUMPS, EXHAUSTERS and BOOSTERS can be put, is almost unlimited. They can be used for handling air, gas, steam, water and all other fluids.

These pumps may be driven by belt, by direct connected steam engine, by electric motor direct connected or through gear and pinion, or by silent chain.

If you wish correct and efficient pump service write for a "CONNERSVILLE" catalog.

THE CONNERSVILLE BLOWER CO.

CHICAGO
929 Monadnock Bldg.

CONNERSVILLE, IND.

NEW YORK
114 Liberty St.

THE IRON TRADE REVIEW

Vol. LX Cleveland, May 31, 1917 No. 22

Government Closes Ship Tonnage

Announcement of Shipping Board Gives 3,000,000 Tons to Steel Corporation and Independents—Fabricating Shops Being Mobilized to Great Task —Centralized Direction of Industry Grows—Iron Keeps Up Rise

CENTRALIZED direction of the iron and steel business in the interest of a more perfect mobilization of general industry for war purposes, grows with each passing week. Production in primary lines is being facilitated and is untouched by federal authority, but in distribution, the control is becoming more and more complete. To a similar degree, open market sales of steel products are being narrowed. Contracts are being refused widely, as the mills are unwilling to increase their obligations to the trade until order books are further cleared. New general business is being kept to a minimum and more strictly is being limited to definite requirements. Even these are being scanned more closely. The retrenchment among consumers, forced both by inability to get material and by the adoption of more conservative business policies, is reflected in the falling off of mill specifications in various lines.

Prepare Shops For Ships

Interest continues to be focused on the emergency ship building proposal, because of the great tonnage of steel involved. The unified and highly patriotic action of the steelmakers at the meeting of the American Iron and Steel Institute, in publicly pledging themselves to furnish all the plain material required, passes this undertaking along to the stage of co-ordination and organization of fabricating shop capacity. Official announcement is made at Washington today that 3,000,000 tons of fabricated ship steel has been placed with the Steel Corporation and the Lackawanna Steel Co. Various shops have signified the part they can fill in standardized construction. Large assembling and fitting-out plants will be erected at tidewater to handle the tonnage as fast as the shops can turn it out. As the use of wood for ships on a large scale becomes more remote, the responsibility on the steel mills and shops has been increased proportionately. The latest line-up provides for about 2,500,000 tons of steel and 500,000 tons of wooden ships in 18 months. This means a steel requirement of not less than 1,000,000 tons. Chicago mills have been allotted about 25,000 tons of shapes and plates for ships already placed.

Ore Traffic Far Behind

The iron ore season is entering June about 4,000,000 tons behind last year, due to unfavorable navigating conditions. This reduction will lose much of its significance, however, if the plans of the general committee in charge of ore and coke to keep excess stocks from accumulating in consumers' hands is carried out. As a preliminary step, a canvass of normal furnace needs is in progress. A meeting in Cleveland this week will consider this and related subjects.

Iron Prices Go Higher

Pig iron keeps to its upward course without interruption, but shipping difficulties are increasing. This has lead to the expectation of broader government direction in time, the extent of which still is a matter for speculation. Basic has given the week some further large sales, with buying running more freely into next year. A Coatesville plant has increased its recent total to 45,000 tons; a Canton, O., consumer has added 6,000 tons or more for next year, making about 45,000 tons obtained this month; Middletown, O., closed for a tonnage from southern Ohio, and a Perth Amboy, N. J., plant for 5,000 tons. A 9,000-ton inquiry is current at Pittsburgh. Foundry and malleable have been in good demand at rising prices. A New York state equipment interest took 10,000 tons. An eastern soil pipe maker has decided not to buy 5,000 to 10,000 tons. The Westinghouse Machine Co. is closing for 6,000 tons, and a Trenton, N. J., buyer has placed 5,000 tons. Northern foundry grades have been sold at $46 for this year and $45 for next. Chicago iron for this year has gone to $46, furnace. On 8 per cent silveries for next year, $60 furnace has been named.

Implement manufacturers are inquiring for next year's contracts, but are being held off by the mills. The railroads are buying considerable material to build equipment in their own shops because of the latter's high cost.

THE OPEN HEARTH

The Challenge is Accepted

NO MORE inspiring scene ever marked a similar occasion as when Major General George W. Goethals, standing before the members of the American Iron and Steel Institute at New York Friday night, called for the vigorous and complete support of the steel makers of the land as indispensable to the great task which he had undertaken of building several million tons of shipping within 18 months. The response that sprang spontaneously from the hundreds to whom he addressed his appeal must have gratified his very soul and have gripped him anew with a characteristic resolve to carry through this unparalleled enterprise. The manufacturers rose to their feet as one man and with a demonstration of patriotic enthusiasm pledged their mills and their shops to the success of the undertaking. It was a challenge to the American steel industry to match its forces and ingenuity against the cunning might of a powerful foe with civilization the stake. The intense spirit of determination in which the gage of the far-flung battle of industry was accepted foreshadows the result.

This stirring event was the culmination of a day that will be recorded without parallel in the history of the organization. As Judge Gary fitly pronounced it, in his final word, the day was the greatest the Institute ever has known. It was a time and occasion when great movements of vital importance to the nation in its hour of stress were instituted or advanced. Strong, constructive patriotism was dominant. Co-operation for welfare of country was foremost in purpose.

By its manifestation of loyalty to its flag and of unity of action the American Iron and Steel Institute has added to its glory and has proved the practical wisdom of its existence. The nation at large well may view with an added sense of security and of pride the possession of such an organization.

A Game That is Not Worth the Candle

MUCH has been said and volumes have been written regarding the conservation of the country's resources and the organization of industries to place the nation in a position to wage aggressive warfare against the Central Powers. However, far too little emphasis has been placed upon that most vital factor in the production of food supply and munitions—the human element. Perhaps the legislators in several states who have been active in having repealed the laws governing child labor and minimum working hours have been sincere in their motives; perhaps the scarcity of labor has brought some pressure to bear, but regardless of the impelling factor, this kind of legislation is wrong in principle. Instead of affording relief and assistance, it aggravates the situation and destroys the progressive, constructive work of sociologists whose return for years of patient, arduous effort, at the best, was too few welfare laws. With the experiences of England and France before us, we ought to appreciate that we cannot hope to establish a short cut to victory by such procedure.

Similar movements were inaugurated and tried by England during the first year or so of the war, but their fallacy is acknowledged in a recent official bulletin of the English Health of Munition Workers' committee. It is of significance that the hours and conditions of labor in most of the trades under present English laws are, in not a few cases, more considerate of the workers than our own. After all, such regulation must depend, not on laws, but upon understandings between employers and employes and it is interesting to note that when England decided to alter the schedules she conferred with representatives of the trade unions. The uncompromising experience of the war has proved beyond any question of doubt that the so-called welfare provisions were based upon physiological laws which may only be violated at the expense of the health of the workers and a departure from sustained maximum production.

Manufacturers to Help Each Other

MEN who have constantly advocated the elimination of trade secrets and the exchange of information regarding methods of manufacture have just cause for gratification over the outcome of the discussion at the spring meeting of the American Society of Mechanical Engineers, held at Cincinnati last week. Realizing that the United States cannot obtain the maximum benefit of its vast potential capacity for making munitions unless there is a greater spirit of co-operation between the managements of the various plants, the engineers and manufacturers in session at Cincinnati expressed a willingness to do away with secrets in munitions manufacture, to welcome the interchange of information, and to virtually pool the experience of all for the benefit of the nation. This means that no longer will a manufacturer be obliged to spend thousands of dollars and months of valuable time in experimental work preparatory to making munitions. It will put an end to wasteful duplication of effort and will effect large savings in the cost of making war materials.

It is to be hoped that the example set by munitions makers will be followed in other lines of manufacture. At the present time, when every effort should be made to count effectively against Germany, there is little excuse for refusal or hesitancy to give informa-

THE OPEN HEARTH

tion which will assist others to make articles better and cheaper. The United States can well afford to follow the example of Canada, where under the pressure of war, manufacturers gladly opened their plants to their erstwhile competitors. The spirit of co-operation which prevails among the manufacturers in the northern dominion is one of the factors which has knit that country into England's most efficient and valuable possession. Although it is undoubtedly the intention to maintain the feature of co-operation in manufacturing only for the period of the war, it is predicted that before peace is declared, the advantages of the liberal exchange of ideas and information will have become so widely recognized that there will be no desire to go back to the close-fisted policy of trade secrets.

Price Advances in Sheets Analyzed

DETAILED figures showing how quotations on sheet mill products have advanced, how sheet bars have tripled in price, how labor costs have increased and how the spelter market has fluctuated since December of 1915, are offered in this issue of *The Iron Trade Review*. The comparison table, which is exceedingly complete and comprehensive, was prepared by the National Sheet and Tin Plate Manufacturers' Association.

It is not surprising that steel sheets have advanced from 91 per cent to 209 per cent, when quotations on sheet bars have jumped upward more than 200 per cent, while costs of labor have increased about 71 per cent in the last 17 months. The only important material entering into the manufacture of sheets to decline in price since December of 1915 is spelter. After the outbreak of the war in Europe, spelter sold at unprecedentedly high levels. The price has declined from 16.72c to 9.25c per pound during the period covered by the report.

Sheet bars have jumped from $33 to $100 a ton in the past 17 months, and sales have been made in isolated instances at as high as $110 a ton. Although sheet makers generally obtain their raw material requirements through long term contracts, it is likely that many of them will pay $100 a ton for sheet bars before the end of the year. Black, galvanized and blue annealed sheets have advanced 179.50, 209.75 and 91 per cent, respectively, during the past 17 months. Minimum quotations on all three products have advanced $5 to $10 a ton since the report was completed.

Hot mill men, receiving $9.093 in December of 1915, now are obtaining $15.618 per net ton. Just as soon as wages of hot mill men are based upon the quotation prevailing at the time the report was issued, hot mill employes will receive $25.22 per ton, or 177.35 per cent above the rate offered at the close of 1915. Wages of common laborers in the last 17 months have increased from 17½ cents to 30 cents an hour. These compilations show that the sheet manufacturer at present prices, while enjoying large profits, has a higher raw material and labor cost relatively than obtains in most of the major finished lines.

Enlarging The Commerce Commission

LEGISLATION before congress enlarging the membership of the interstate commerce commission from seven to nine is wholly desirable. Duties devolving upon this latter body are extremely heavy under normal conditions. Now that they will be vastly increased by reason of perplexing and many problems of transportation arising in connection with the war situation, it is vitally necessary that the commission be given more members and its plan of procedure greatly changed. The original proposal which would have meant merely an additional number of members of the commission without readjustment of its method of transacting business perhaps would have done more injury than good. The pending bill apparently meets all requirements. It authorizes the commission to divide its members "into as many divisions as it may deem necessary, which may be changed from time to time", and each division is given plenary power with regard to proceedings over which it presides. Obviously, this will immeasurably expedite the work of the commission, for, assuming it were divided into three parts, sitting in as many districts of the country, each division could do as much as can be accomplished now by the entire commission.

The war situation has already developed questions which show the further pressing need of increasing the membership of the commission. For instance, congress has passed a measure which authorizes the commission to "make such just and reasonable directions with respect to car service during such time as in its opinion will best promote car service in the interest of the public and the commerce of the people." Allied with this bill is another, giving the President the right to fix priorities in transportation. The commission will be the directing force back of this.

Increasingly intelligent co-operation between shippers and the railroads, with more satisfactory and expeditious results for both, ought to grow out of the pending legislation. Essentially this means greater safety for the national welfare.

Iron and Steel Prices

Corrected to Wednesday Noon

PIG IRON

(Delivery this year.)

Bessemer valley	$46.00 to 48.00
Bessemer, Pittsburgh	46.95 to 48.95
Basic, Pittsburgh	42.95
Basic, eastern Pa.	42.00
Basic, Buffalo	43.00 to 45.00
Malleable, Pittsburgh	44.45 to 45.95
Malleable foundry, Chicago	46.00
Malleable foundry, Phila.	44.00
Malleable foundry, Buffalo	46.00 to 47.00
No. 1X foundry, Phila.	44.00 to 44.50
No. 2 foundry, Pittsburgh	43.95
No. 2 foundry, Cleveland	44.95 to 45.30
No. 2 foundry, Ironton	40.00 to 42.00
No. 1 foundry, Chicago	47.00
No. 2 foundry, Chicago	46.00
No. 2X foundry, Phila.	43.50 to 44.00
No. 2X foundry, N. J. tide	43.50 to 44.00
No. 2X foundry, Buffalo	45.00 to 46.00
No. 2 plain, Philadelphia	43.25 to 43.75
No. 2 plain, N. J. tide	43.25 to 43.75
No. 2 plain, Buffalo	45.00
No. 2 southern, Birmingham	39.00 to 40.00
No. 2 southern, Cincinnati	41.90 to 42.90
No. 2 southern, Chicago	42.00 to 44.00
No. 2 south'n, Phila. delivery	42.50 to 43.00
No. 2 southern, Cleveland	42.00 to 43.00
No. 2 south'n, N. Y. docks	42.25 to 43.25
No. 3 south'n, Boston docks	42.50 to 43.50
No. 2 south. Interior, N. E.	43.00 to 44.00
No. 2 southern, St. Louis	41.40 to 43.40
Virginia No. 2X, furnace	40.00 to 42.00
Virginia No. 2X, Phila.	42.75 to 44.75
Virginia No. 2X, Jersey City	43.00 to 45.00
Virginia No. 2X, Boston	43.25 to 45.25
Gray forge, eastern Pa.	39.00 to 40.00
Gray forge, Pittsburgh	43.45
Gray forge, Birmingham	38.00
Silveries 8 per cent, furnace	50.00 to 52.00
Silveries, 8 per cent, Chicago	53.00 to 54.00
Low phos. standard, Phila.	76.00 to 78.00
Low phos. Lebanon, furnace	70.00 to 80.00
Low phos., Pittsburgh	70.00 to 75.00
Charcoal, Superior, Chicago	49.25 to 51.75
Charcoal, Buffalo	52.00 to 53.00
Charcoal, Birmingham	45.00 to 50.00

COKE

(At the ovens.)

Connellsville furnace	$9.00 to 9.50
Connellsville furnace, contract	8.00 to 8.50
Connellsville foundry, contract	8.50 to 9.50
Connellsville foundry	10.25 to 10.50
Wise county furnace, contract	7.00 to 9.00
Wise county foundry, contract	8.00 to 10.00
Pocahontas furnace, contract	7.00 to 9.00
New River foundry, contract	8.50 to 11.00
New River furnace, contract	7.50 to 10.00

FERRO ALLOYS

Ferro manganese, prompt	$400 to 475
Ferro manganese, last half	375 to 425
Spiegeleisen, 20 per cent furnace remainder of year	75.00 to 85.00
Ferrosilicon, 50 per cent, Pitts., nominal	250.00
Ferrosilicon, 50 per cent, Phgh., 1st quarter	150.00
Bessemer ferrosilicon, 9 per cent	$69.00
Bessemer ferrosilicon, 10 per cent	70.00
Bessemer ferrosilicon, 11 per cent	72.50
Bessemer ferrosilicon, 12 per cent	75.00
Bessemer ferrosilicon, 13 per cent	80.00

Ferrosilicon prices at Ashland, Ky., Jackson and New Straitsville, O., furnaces.

SEMI-FINISHED MATERIAL

BILLETS

Open hearth, Pittsburgh	$90.00 to 95.00
Open hearth, Philadelphia	90.00
Open hearth, Youngstown	90.00 to 95.00
Bessemer, Pittsburgh	90.00 to 95.00
Bessemer, Youngstown	90.00 to 95.00
Forging, Pittsburgh	110.00 to 115.00
Forging, Philadelphia	115.00
Forging, Chicago	100.00

SHEET BARS

Open hearth, Pittsburgh	$90.00 to 100.00
Open hearth, Youngstown	90.00 to 100.00
Open hearth, Cleveland	100.00
Bessemer, Pittsburgh	90.00 to 100.00
Bessemer, Youngstown	90.00 to 100.00

WIRE RODS, MUCK BAR, SKELP.

Wire rods, Pittsburgh	$90.00 to 95.00
Muck bar, Pittsburgh	70.00
Grooved steel skelp, Pitts.	4.00c
Sheared steel skelp, Pitts.	4.50c

SHAPES, PLATES AND BARS

Struc. shapes, con. Pitts.	4.00c to 4.50c
Structural shapes, Phila.	4.159c to 4.659c
Structural shapes, N. Y.	4.169c to 4.669c
Structural shapes, Chicago	4.44c to 5.44c
Tank plates, Chicago	7.69c to 8.19c
Tank plates, Pitts. (con.)	4.50c to 5.00c
Tank plates, Pittsburgh	6.00c to 8.00c
Tank plates, Philadelphia	5.159c to 8.159c
Tank plates, New York	5.169c to 8.169c
Bars, soft steel, Chicago	3.94c to 4.69c
Bars, soft steel, Pittsburgh	3.50c to 3.75c
Bars, soft steel, New York	3.919c to 4.169c
Bars, soft steel, Phila.	3.909c to 4.159c
Hoops, Pittsburgh	5.00c to 5.25c
Bands, Pittsburgh	4.75c to 5.00c
Cotton ties, Pbgh., 45 lbs., June basis	$2.10
Shaftg, Pittsburgh carloads	10 to 5 off
Bar iron, Chicago	3.75c to 4.00c
Bar iron, Philadelphia	4.159c
Bar iron, Cleveland	3.50c
Bar iron, New York	4.169c
Bar iron, Pittsburgh	4.00c
Hard steel bars, Chicago	3.50c to 3.75c
Cut nails, Pittsburgh	3.70c

RAILS, TRACK MATERIAL

Angle bars, Pittsburgh, base	3.00c to 3.25c
Angle bars, Chicago, base	3.25c
Standard bessemer rails, mill	$38.00
Stand. open hearth rails, mill	40.00
Light rails, 25 to 45 lbs., Chic.	60.00
Light rails, 25 to 45 lbs., Pitts.	60.00
Relayers, standard, mill	38.00 to 40.00
Relayers, light, Chicago	40.00
Relaying rails, light, St. L.	52.00 to 55.00
Spikes, railroad, Pittsburgh	4.00c
Spikes, railroad, Chicago	4.00c to 4.15c
Track bolts, Pittsburgh	5.50c to 8.00c
Track bolts, Chicago	5.00c to 5.15c
Tie plates, Chicago	$60.00 to 65.00

WIRE PRODUCTS

(To jobbers; retailers 5 cents more.)

Wire nails, Pittsburgh	$3.50
Coated nails, Pittsburgh	3.50
Plain wire, Pittsburgh	3.45
Galvanized wire, Pittsburgh	4.15
Polished staples, Pittsburgh	3.65
Galvanized staples, Pittsburgh	4.35
Barb wire, painted, Pittsburgh	3.65
Barb wire, galvanized, Pittsburgh	4.35

RIVETS

Structural rivets, Pittsburgh	4.75c
Boiler rivets, Pittsburgh	4.85c
Tinner's rivets, Pittsburgh	40 and 10 off

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SHEETS

(In cents per pound.)

SHEET MILL BLACK.

No. 28, open hearth, Pitts.	7.85c to 8.50c
No. 28, bessemer, Pitts.	7.75c to 8.50c
No. 28, open hearth, Chgo.	7.69c to 8.19c

TIN MILL, BLACK

No. 28, open hearth, Pitts.	7.85c to 8.50c
No. 28, bessemer, Pitts.	7.75c to 8.50c

GALVANIZED

No. 28, open hearth, Pitts.	9.60c to 10.50c
No. 28, bessemer Pitts.	9.50c to 10.50c
No. 28, open hearth, Chgo.	9.69c to 10.19c

BLUE ANNEALED

No. 10, open hearth, Pitts.	7.60c to 8.00c
No. 10, bessemer, Pitts.	7.50c to 8.00c
No. 10, open hearth, Chgo.	7.19c to 7.69c
No. 10, open hearth, Phila.	7.659c

TIN PLATE

(Per 100 lb. box.)

Tin plate, coke base, prompt	8.50c to 11.50c
Terne plate, I. C. nominal	7.15c to 8.00c
Terne plate long, nominal	8.00c

IRON AND STEEL PIPE

(Prices adopted May 1, 1917.)

Steel

Diameter in inches.	Black. Per cent off.	Galv. Per cent off.
¼ to 3, butt	49	35½

Iron.

(Prices adopted May 1, 1917.)

Diameter in inches.	Black. Per cent off.	Galv. Per cent off.
¼ to 1½, butt	38	22

BOILER TUBES

(Price adopted April 2, 1917.)

Steel, 3½ to 4½ inches, l. c. l.	34
Iron, 3½ to 4½ inches, l. c. l.	28

CAST IRON WATER PIPE

(Class B Pipe.)

Four-inch, Chicago	$58.50
Six-inch and over, Chicago	55.50
Four-inch, New York	58.50
Six-inch and over, New York	55.50
Four-inch, Birmingham	55.00
Six-in. and over, Birmingham	52.00

Class A pipe is $1 higher than Class B.

STEEL SHEET PILING

Base sizes, Pittsburgh 3.50c to 4.00c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil, Pittsburgh, 7.00c

COLD ROLLED STRIP STEEL

(Hard coils 1½ inches and wider by 0.100 inch and heavier.)

Base, per 100 pounds 8.00c to 8.25c

NUTS AND BOLTS

(Delivered within 20-cent freight radius.)

CARRIAGE BOLTS

(⅜ x 6 inches, smaller and shorter.)

Rolled thread	40
Cut thread	35
Larger or longer	25

MACHINE BOLTS

(⅜ x 4 inches, hot pressed nuts.)

Rolled thread	40 and 10
Cut thread	40
Larger and shorter	30
Cold pressed, semi-finished, hexagon nuts	50 and 10
Gimlet and cone point lag bolts	45

NUTS

Hot pressed, square, blank	$2.10 off
Hot pressed, square, tapped	1.90 off
Cold pressed, square, blank	1.70 off
Cold pressed, square, tapped	1.50 off
Hot pressed, hexagon, blank	1.60 off
Hot pressed, hexagon, tapped	1.40 off
Cold pressed, hexagon, blank	1.60 off
Cold pressed, hexagon, tapped	1.40 off

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products May 29, average for April, 1917, average for February, 1917, and average for May, 1916. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices May 29, 1917.	Average prices April, 1917.	Feb., 1917.	May, 1916.		Prices May 29, 1917.	Average prices April, 1917.	Feb., 1917.	May, 1916.
Bessemer iron, Pittsburgh.....	$46.95	$42.20	$35.95	$21.95	Iron bars, Chicago mill.....	$3.75	$3.19	$3.00	$2.35
Basic pig iron, Pittsburgh.....	42.95	39.20	30.95	18.95	Beams, Chicago	4.44	3.79	3.38	2.69
No. 2 Foundry iron, Pittsburgh	44.45	39.95	33.95	19.45	Beams, Pittsburgh	4.00	3.70	3.25	2.50
No. 2 Foundry iron, Chicago..	46.00	39.25	31.25	19.00	Beams, Philadelphia	4.659	4.159	3.509	2.659
Lake Superior Charcoal, Chicago	49.25	42.25	34.50	19.75	Tank plates, Pittsburgh.....	4.50	4.50	3.75	2.75
Malleable, Chicago	46.00	39.00	31.25	19.50	Tank plates, Chicago.....	7.69	4.69	3.94	3.09
Southern No. 2, Birmingham...	39.00	35.79	24.50	15.00	Tank plates, Philadelphia.....	8.159	6.909	5.009	3.909
Southern Ohio No. 2, Ironton.	42.00	38.60	33.00	18.50	Sheets, blk., No. 28, Pittsburgh	7.75	5.75	4.56	2.92
Basic, eastern Pa.....	42.00	38.25	30.50	20.00	Sheets, blue anld., No. 10, Pitts.	7.50	5.37	4.37	3.02
No. 2X Virginia, furnace.....	43.00	38.25	29.00	18.00	Sheets, galv., No. 28, Pittsburgh	9.50	7.56	6.50	4.88
No. 2X foundry, Philadelphia...	44.75	41.50	32.00	20.50	Wire nails, Pittsburgh.....	3.50	3.20	3.00	2.50
Ferro mang., delivered.....	425.00	360.00	265.00	175.00	Connellsville fur. coke, contr...	8.00	7.25	8.00	2.60
Bessemer billets, Pittsburgh....	90.00	72.50	62.50	41.20	Connellsville fdy. coke, contr...	8.50	7.87	6.50	3.50
Bessemer sheet bars, Pittsburgh	90.00	72.50	62.50	41.20	Heavy melting steel, Pittsburgh	29.00	28.12	21.87	17.12
Open hearth sheet bars, Pitts..	95.00	72.50	62.50	41.20	Heavy melting steel, eastern Pa.	26.00	25.15	20.50	16.75
Open hearth billets, Pittsburgh.	95.00	72.50	62.50	41.20	Heavy melting steel, Chicago...	32.50	26.65	21.65	16.50
Steel bars, Pittsburgh.....	3.50	3.387	3.00	2.50	No. 1 wrought eastern Pa.....	42.00	38.50	27.00	22.50
Steel bars, Chicago.....	3.94	3.54	3.14	2.69	No. 1 wrought, Chicago.....	36.50	29.80	24.00	16.35
Iron bars, Philadelphia.....	4.159	3.659	3.259	2.559	Rerolling rails, Chicago.....	41.50	31.88	25.63	17.25
Iron bars, Cleveland, local del'y.	3.50	3.25	3.00	2.40	Car wheels, Chicago.....	34.50	23.25	18.30	13.13

*Seaboard.

(For Additional Prices See Page 1210.)

Basic Sales Grow to Large Tonnage

Eastern Pennsylvania and Canton Melters Increase Purchases to About 45,000 Tons Each—Other Eastern and Middletown Buyers Close—Round Lots of Foundry Placed—Higher Prices Generally

Philadelphia, May 28.—A Coatesville, Pa., steelmaker who last week closed for 12,000 to 15,000 tons of basic for late this year, as reported, has increased his purchases to 45,000 tons. The price was $42, delivered. This business was divided between three eastern Pennsylvania furnaces, one taking 20,000 tons, another 15,000 and another 10,000. Of the total, 15,000 to 20,000 tons are for delivery this year and the remainder over the first half. These additional tonnages make a total of approximately 105,000 tons of basic for which this buyer has closed over the past two months. Basic is quoted at $42, delivered eastern Pennsylvania. Several smaller tonnages, however, mainly for export, have been closed recently at $42.50, furnace. In some cases asking prices range from $1 to $3 higher. Foundry iron has been fairly active during the week. Most of the business has involved small lots. No. 2X for this year now is at a minimum of $44, eastern Pennsylvania, while sales around 500 tons freely have been made at $45. Small prompt lots of foundry are being made at $2 to $3 higher than this range. Prices on first half are moving up. One eastern Pennsylvania maker a week ago was selling at $40, furnace, for first half, has advanced to $42 and has sold good-sized blocks at this figure. The Baltimore & Ohio railroad has bought approximately 500 tons of foundry for last half for Mont Clare, Md. Two Virginia furnaces which withdrew from the market recently have accepted moderate sized tonnages from a few regular customers for this year, and some of this business was taken at $43, furnace, for No. 2X. One Virginia maker now is asking $45 for the remainder of the year. A Washington melter is reported to have closed for several thousand tons of bessemer. A nearby consumer has closed for 1,000 to 2,000 tons of gray forge for this year at $43, delivered.

Large Sales at New York

New York, May 29.—Numerous large tonnages of basic and foundry iron have been closed in this district during the week. A large railway equipment manufacturer distributed 8,000 tons of foundry and 2,000 tons of basic for the first half of next year to New York state plants. Of this business, 5,000 tons of foundry went to one Buffalo furnace and 3,000 tons of foundry and 2,000 tons of basic to another. A large consumer who recently inquired for approximately 7,500 tons of foundry for first half delivery to two of its eastern plants, has decided not to buy. A Trenton, N. J., consumer has closed for 5,000 tons of No. 2X for first half, the business being divided between two furnaces. Numerous other tonnages have been closed in New Jersey and New England, principally. A number of blocks involving 1,000 to 2,000 tons of foundry are under negotiation with Jersey melters and many smaller tonnages are up for action. Most of this iron is for first half. Demand for basic now is extending on a large scale to first half requirements. A Jersey interest has closed for 5,000 tons of basic for first half and a New York state melter for 2,000 to 3,000 tons. Other inquiries pending in this district total 10,000 to 15,000 tons. Another sale of a considerable tonnage of basic for export has been done at $42.50, eastern Pennsylvania furnace. Japan wants further tonnages of this grade. The market on eastern Penn-

(*For miscellaneous prices see page* 1210)

sylvania No. 2X for this year is $43.50 to $44, furnace, with less than $44 increasingly hard to get. First half business continues to be booked at $40, furnace, for No. 2X. A Buffalo seller who recently has been selling first half No. 2X at $41, furnace, now is quoting $42 and has advanced to $45, furnace, for nearby. Another leading Buffalo maker continues to quote $46 for this year and $43 for first quarter.

Makers Practice Economy

Pittsburgh, May 29.—Blast furnace managers, acting under instructions of the Lake Superior Iron Ore Association, are filling out reports designating their actual iron ore requirements for the period from May 1, 1917, to June 1, 1918. Prices continue to advance all along the line. Bessemer is $46, valley, $1 a ton above the previous price, and foundry, malleable and gray forge have jumped 50 cents a ton this week. The United Alloys Steel Corporation, Canton, O., has continued to buy basic for extended delivery. It has closed for 6,000 tons for first half at a reported price of $41, valley, bringing its May purchases to about 45,000 tons. Follansbee Bros., Follansbee, W. Va., are inquiring for 9,000 tons of second half basic. The American Steel Foundries wants 3,000 tons of prompt bessemer for its works at Pittsburgh and Franklin, Pa., and the Union Steel Casting Co., Pittsburgh, 1,000 tons of bessemer for second half. The Westinghouse Machine Co. is closing for 6,000 tons for Nos. 1, 2 and 3 foundry grades for delivery the second half of this and the first half of 1918 to Trafford City, Pa. Foundry has sold at $45 for this year, and a 1,000-ton lot for the first half of 1918 commanded $44, valley.

Buffalo Inquiry Increases

Buffalo, May 28. — Sales by Buffalo furnaces in the past week have totaled 15,000 to 20,000 tons of all grades, principally for delivery during the first quarter and half of 1918. The producers for the most part are sold up solidly over the remainder of the current year. There is an increasing inquiry and the aggregate is large. One producer has stopped quoting on anything, to old customers or new, for delivery beyond 90 days and has declined to give consideration to needs of melters extending into next year. Another interest is not quoting on advanced deliveries at less than the stiff prices prevailing for 1917 deliveries and has sold a moderate tonnage of foundry grades for last half at $48. Another producer with some tonnage available has been quoting $46 as an average for No. 2X foundry for prompt delivery and last half. While the tendency of prices is upwards there has been no appreciable change from the schedule reported a week ago.

Box Car Shipments Increase

Cleveland, May 29.—Shipment of pig iron by box cars is extending owing to the use of open top cars in the coal and ore traffic. Though this entails considerable extra expense and inconvenience for the furnaces, they are accepting the situation philosophically by utilizing all the equipment that is being furnished them and are taking pains to see that it is loaded to full capacity. Steady buying in good quantity continues to push up prices. One Cleveland interest sold about 75,000 tons in May. Valley foundry has been sold for first half at $44, furnace, 1,000 tons going at this figure. Other grades have brought $1 more for next year and $2 more for delivery by Jan. 1. Malleable had been active. A local consumer closed for about 5,000 tons for this year and next, dividing it between lake and southern Ohio makers. Two sales of 1,000 tons each of malleable to Indiana and Ohio melters for first half of 1918 were at $43, lake furnace. The sellers now want $44. A 2,000-ton lot of low silicon foundry for next year went at $42, lake furnace. On about 500 tons of 8 per cent southern Ohio silveries for next year, $60, furnace, was named. The strike of furnacemen in the Jackson district continues and three stacks remain banked. Basic has been in good demand. A Canton steelmaker bought 6,000 tons for first half of next year at a reported price of $41, valley. This brings the total purchases of this interest in May at about 45,000 tons. A Middletown, O., buyer who inquired this week for 10,000 tons for first half of 1918 has closed for some tonnage in southern Ohio. Basic for this year is scarce and $42, valley, is believed to have been passed. A 10,000-ton inquiry for Japan is current.

Northern Iron Advances Further

Chicago, May 28.—Northern foundry and malleable have been advanced $1 and now is quoted at $46, furnace, for last half of 1917 and $44 for first half of 1918. Sales have been made at the advanced price, which seems firmly established. On iron from a Wisconsin stack, which compares in analysis with southern iron, $39, furnace, is quoted in competition with Birmingham grades. Inquiry and sales are somewhat lighter than during previous weeks. Heavy buying by most consumers has taken many of them from the market. Southern iron is somewhat uncertain. For prompt and last half delivery it is difficult to obtain quotations and for first half of 1918, $38 to $40, Birmingham, is quoted by various makers. One large interest has quoted $42, Birmingham, for last half of 1918, and $38 for first half, with a provision that the tonnage of 1918 iron be double that for 1917. Small lots of prompt southern iron have been sold recently at $46, Chicago. Jackson County silveries are practically unobtainable and 8 per cent silicon from a maker further south is quoted at $52.75, delivered, Chicago. Lake Superior charcoal iron remains unchanged with furnaces well sold up for the remainder of this year.

(*For miscellaneous prices see page* 1210)

Scarcity is More Acute

St. Louis, May 26.—Consumers of pig iron in this market report increasing difficulty in securing supplies. Tonnages under contract are moving fairly well, but consumers needing additional iron either are unable to get it, or must pay fancy prices for odd car lots. Manufacturers are reporting an enormous demand for their products, and much of the new business is of a character requiring quick delivery. Price seems to cut no figure, the main object being to get the goods. Much promising business, however, is being refused because of the scarcity of pig iron. The foundries which supply this center are offering no castings for 1917 delivery, and a large portion of their 1918 production has already been contracted for.

Southern Prices Strengthen

Cincinnati, May 28.—General inquiry for foundry iron in this territory is light. Southern prices continue to grow stronger, although no changes have been made the past week. No No. 2 foundry can be bought in the south for third quarter shipment below $40, but in some cases fourth quarter contracts may be made, with shipments extending into next year at about $2 a ton below this price. First half quotations have been advanced to a minimum of $38, Birmingham, but some of the furnaces are holding firm at $40, and have sold some iron at this figure. Northern basic is more active. Middletown interests who have been in the market for 10,000 tons for first half are understood to have placed some tonnage with a southern Ohio furnace. Northern foundry is quiet. Some southern Ohio malleable was sold this week for northern Ohio delivery and about $40, furnace, is asked. Northern furnaces are holding firm at $43 for this year's shipment and at $42 for next year. Considerable complaint is current on the car situation. Shipments frequently take 30 days to get

through to destination, whereas heretofore the usual time would only be six or seven days. The strike situation in the Jackson district remains unchanged.

Southern Traffic Improves

Birmingham, May 29.—Additional strength is being gained weekly by the southern pig iron market and manufacturers in position to sell any iron are finding no trouble to book business. Inquiries are liberal. Quotations are higher. While $36 is announced as a minimum for No. 2 foundry for the first half of next year, sales have been made at $38. But little iron appears to be obtainable for this year. The very few sales are in small lots and are at $40, and even higher for No. 2. The railroad car situation has eased up greatly though there are some embargoes still to be considered. The accumulated stocks will be reduced somewhat during the next four weeks if the improvement in the car situation continues. During the first two weeks of May much iron was forced on the yards through the inability of the railroads to move it. The local melt of iron is very satisfactory and the larger consumers located nearby the furnace are not having much trouble over delivery. Charcoal iron holds firm at $45 with $50 asked.

Implement Makers Inquire

Seek Contracts For Next Year But Are Not Accommodated—Specifications Decline—Pennsylvania Railroad Buys

Cleveland, May 29. — Implement manufacturers in this territory are inquiring for contracts for the first quarter or half of next year. The makers, however, are unwilling to take on this business at this time. Where consumers have tonnages owing them still on mill books under former contracts, the producers are adopting the policy of discouraging any new contracts or orders for future delivery. An inquiry for a large number of forgings for 3-inch guns for the government is current.

Implement Makers Inquire

Chicago, May 29.—Buying of soft steel bars is almost an impossibility. The nominal quotation is 3.94c to 4.69c, Chicago, but these figures mean little in the absence of the opportunity to place tonnage. Most regular customers are covered for the present to the ability of makers and no real suffering for steel is being met. Requests are being received from agricultural implement makers for additional tonnages of 500 to 1,000 tons for last half to more closely meet their requirements over present contracts.

Pennsylvania Buys Bars

Philadelphia, May 29.—Apart from the buying of a fair tonnage for car purposes by the Pennsylvania railroad the steel bar market has been comparatively quiet. Specifications, however, have been heavy. Some consumers have been putting in their mill orders 30 days ahead of the schedule date. Bar iron makers have opened their books for third quarter business at 4 cents, Pittsburgh, or 4.159c, Philadelphia, effective May 28. Machine bolts have been advanced to 35 and 5 off for ⅜ x 4 inches and larger. Loose nuts again have been raised 10 cents per 100 pounds by lowering the discount from $2.40 to $2.30. Other nut and bolt prices have been advanced accordingly.

Bar Specifications Decline

Pittsburgh, May 29.—Manufacturers of steel bars report specifications against contracts have fallen off considerably since the United States became an active participant in the war. It is not likely that domestic demand will attain previous proportions until after the general situation has adjusted itself. Leaders of the industry express the belief that manufacturing companies of all kinds will pursue extremely conservative policies until after the government has outlined its activities more definitely. Although numerous contracts have been placed for munitions, it is difficult to trace these orders to rolling mills. Steel bars nominally are quoted at 3.50c and iron bars at 4c.

Reinforcing Bars Are Firmer

Cleveland, May 29.—Reinforcing bars show a somewhat stronger tone especially for future delivery owing to the rising prices and the reduced quantity of scrap supplies. Makers are disinclined to sell ahead at current prices. For early delivery, however, 3.25c and perhaps lower still can be done.

Hard Bars are Steady.

Chicago, May 29.—Although rerolling rails are scarce and the price has advanced sharply recently, hard bars rerolled from rails remain at the same price as last week, 3.50c to 3.75c, Chicago, being quoted generally. Demand from reinforced concrete users is improving but still is short of the usual tonnage. Most demand is coming from manufacturers substituting this form of steel for soft steel and iron bars. An advance to keep pace with the increasing cost of rails is thought inevitable. Though regular customers are not buying at present they are anticipating their contracts and are receiving last half bars during the second quarter.

(*For miscellaneous prices see page* 1210)

Chicago Bar Iron Up $10.

Chicago, May 29. — Following an advance of $5 per ton on bar iron 10 days ago Chicago makers have made a further advance of $10 per ton, bringing the quotation to 4c, Chicago mill. Sales were made within the past week at 3.50c, but this price seems to have disappeared and all business now appears to be at 4c. The largest factor in this increase is the sudden upward movement of scrap, which has gone forward with new impetus. Sales are light as most regular customers have covered.

Ship Activity Stimulates Rivets

Pittsburgh, May 29.—Demand for nuts, bolts and rivets is heavier than ever before in the history of the trade. Ship builders along the Atlantic and Pacific coasts and the Great Lakes are specifying for tremendous tonnages in the aggregate. Premium prices are being paid for prompt ship rivets. An early advance in prices appears imminent.

Cotton Tie Mills Busy

Pittsburgh, May 29. — Manufacturers of cotton ties are beginning to roll material to bale the 1917 cotton crop. All makers are offering ties at $2.10 a bundle of 45 pounds, June basis. As pointed out a week ago, this figure is the highest recorded in the history of the cotton tie industry.

Shafting Held at 5 Off

Pittsburgh, May 29.—Quotations on cold rolled steel shafting below 5 per cent off the list are disappearing. Fairly heavy tonnages have been sold at the list price for nearby shipment. It is not unlikely that material for future delivery will be sold shortly at above the list.

Hoops and Bands Active

Pittsburgh, May 29.—Consumers of hoops and bands are offering mills attractive premiums, if they will supplement contracts placed some time ago. Little material is being offered in the open market, making it difficult to obtain a line on prices. Hoops are selling at as high as 5.25c and bands have commanded 5c for shipment at the convenience of the mill.

Steel Chain Hardening

Pittsburgh, May 29.—Several manufacturers of steel chain are refusing to sell at 7c for ⅜-inch proof coil. The war has augmented demand for chain for delivery to ship builders.

Ferro Shows Easier Tone

Consumers Feel Needs Will Be Better Filled Under Directed Distribution—Nearby Metal Available at $425

New York, May 28.—Ferro-manganese prices have been more uncertain due mainly to the scattered character of the demand and it has been some time since any large sales were made. The market has reflected a weaker tendency during the week, due probably in a considerable degree that distribution of supplies through federal committees will better meet requirements. Now, however, prices again appear to be tending upward. One domestic maker who was quoting below $400 on second half now will do nothing less than this figure on any shipment this year and on nearby shipment asks around $425. Spot ferro-manganese last week could be had in several quarters at $400 but outside of a few odd carloads $425 to $450 now again are the asking prices. Sales of several hundred tons for this year have been made during the week. No further sales or granting of export licenses are reported in connection with English ferro-manganese.

Further good-sized sales of spiegeleisen have been made at $83, furnace, for delivery this year. Some business, however, also has been booked at $78, furnace. The market on 50 per cent ferro-silicon is devoid of interest.

War Disturbs Alloys

Pittsburgh, May 29.—The market for ferro-manganese and steelmaking alloys is quiet, by reason of general uncertainties. Consumers and dealers are being called upon by the alloys committee, co-operating with the national defense council, to furnish information about the distribution and consumption of 80 per cent ferro-manganese. Just as soon as the committee has completed its census, it is believed that all consumers will be able to obtain their requirements. Several lots of ferro-manganese have been sold at less than $400, delivered, for future shipment. For prompt delivery, dealers are quoting $425 to $450. Twenty per cent spiegeleisen is being held at $80 a ton by most sellers, although some metal was sold at about $70 a few days ago to a large consumer. Fifty per cent ferro-silicon nominally is quoted at $250, Pittsburgh, for prompt, and $150 for the first quarter.

Chicago Ferro Steady

Chicago, May 28.—The local producer of ferro-manganese continues to quote $450, furnace, for prompt or last half delivery. Demand is heavy but there is comparatively little tonnage unsold for this year. Some buying of spiegeleisen has been done in this territory. One consumer is understood to have taken 1,000 tons.

Ore Shipments Fall

Decline 4,000,000 Tons Owing to Delays—Ice Still Heavy

Cleveland, May 29.—Delays resulting from ice conditions continue to restrict navigation on the Great Lakes. Boats have been able to make only slow progress. Trouble was encountered this week at Duluth, Marquette and in the Soo waterways. As a result, accidents continue numerous and a number of ore carriers will lose several trips while undergoing necessary repairs. The delays have set back ore shipments more than 4,000,000 tons, comparing this season with last year's record. In May, 1916, the fleet transported 8,450,000 tons, the year's movement to June 1, being 10,100,000 tons. Ore men generally believe the 1917 shipments will fall behind those of last year, but that ore reserves are large enough to carry the furnaces through the winter. A precautionary step was taken this week by the Lake Superior Iron Ore Association which asked consumers of Lake Superior ore to report the amount of ore necessary to meet actual requirements to June 1, 1918. This action results from an appreciation of the importance of confining the ore movement in war times to actual necessities.

Mill Scales to be Taken Up at Conference

Officers of the Amalgamated Association of Iron, Steel and Tin Workers and sheet and tin plate manufacturers operating under union scales, June 18 at Atlantic City will discuss wage scales for the year beginning July 1. The Amalgamated association will ask that prevailing wage rates in sheet, tin plate and jobbing mills be continued. Bar iron scales for the same period will be considered June 25. The employes will ask for increases of 50 cents a ton for boiling up to the 1.30c bar iron card; of 15 cents on a 1.30c card; of 10 cents on a 1.35c card and of 5c on a 1.40c card.

Work on remodeling certain machinery at the Remington Arms Co. plant, Chester, Pa., is progressing steadily and it is expected that the plant shortly will be turning out arms for the United States government.

Push Sheets For War Uses

Control is Centralized Through Committee of Makers—Restrict Manufacturers' Profits to 10 Per Cent

Pittsburgh, May 29.—To expedite the movement of sheets entering into the manufacture of military necessities, such as shrapnel shell cases, helmets, buoys, mines, camp ranges and enameled ware, the general committee of the American Iron and Steel Institute has named a sub-committee on sheet steel. This committee consists of W. S. Horner, chairman, president of the National Association of Sheet & Tin Plate Manufacturers; Walter C. Carroll, assistant sales manager of the American Sheet & Tin Plate Co., Pittsburgh, and Charles O. Hadly, the Allen-Wood Iron & Steel Co., Philadelphia. Committee headquarters are in the Oliver building, Pittsburgh. This committee will co-operate with the council of national defense to give preferential service to concerns working on government contracts. Mill managers are taking further precautions to protect the interest of the nation during the present war emergency. They not only are requiring buyers to give certificates from government officials relative to war contracts, but many sheet makers are compelling buyers to guarantee that they will not enjoy more than 10 per cent profit on government contracts. Virtually every sheet manufacturer in the Greater Pittsburgh district has withdrawn from the domestic market, making it extremely difficult for consumers to supplement contracts placed early in the year. Black sheets are selling at 7.75c to 8.50c, $10 a ton above prices existing a week ago. Galvanized stock has jumped to 9.50c as a minimum, with small lots commanding as high as 10.50c for No. 28 gage. Blue annealed material is selling at 7.50c to 8c, base.

(*For miscellaneous prices see page* 1210)

Higher Sales in East

Philadelphia, May 29. — Sales of blue annealed sheets have been made by eastern makers during the past week at both 7.50c and 8c, Pittsburgh, or 7.659c and 8.159c, Philadelphia, for No. 10 gage. This represents the range of the market

for the remainder of the year. Several additional tonnages have been placed with eastern mills for government requirements.

Western Prices Go Higher.

Chicago, May 29. — Continued demand and difficulty of producing at the normal rate have forced prices of steel sheets higher in the past week. At present No. 28 gage black command 7.69c to 8.19c, Chicago, and No. 10 gage blue annealed 7.19c to 7.69c, Chicago. No. 28 gage galvanized are quoted at 9.69c to 10.19c, Chicago.

Shop Buying

Restricted by Uncertainty and Scarcity of Material—Navy Yard Contracts

Pittsburgh, May 29.—Many structural undertakings are being held in abeyance, because of the uncertainties caused by the war. Structural mills are being driven to capacity, filling contracts for government work. Scarcely any material is being offered in the open market for domestic shipment. Outbound shipments are no better and many consumers are seriously handicapped, on account of deferred deliveries. Structural shapes nominally are quoted at 4c. The McClintic-Marshall Co. has taken 5,000 tons for a foundry and machine shop for the naval yards at Norfolk, Va.

Ship Material Placed.

Chicago, May 29.—Buying of structural material is becoming less as prices and deliveries increase. Only small work is being undertaken in the west. With 10,000 tons of shapes for shipbuilding purposes placed preferentially through government channels, the leading western mill is beginning to feel the effect of war orders which will play havoc with schedules on former contracts.

CONTRACTS PLACED.

Monroe and Harrison street viaducts at Chicago, Ill., 1,659 tons, for Chicago Union Station Co., to American Bridge Co.

Four thousand truck frames at Chicago, Ill., 580 tons, for Commercial Truckmobile Co. to American Bridge Co.

Car frames at Harvey, Ill., 306 tons, for Chicago Steel Car Co. to independent shop.

Garfield Flume Bridge, New Mexico and Texas, 150 tons, for U. S. Reclamation service to independent shop.

Machine shop and foundry, for United States naval yards at Norfolk, Va., 5,000 tons, to the McClintic-Marshall Co.

Hangars at Pensacola, Fla. 1,100 tons, to Virginia Bridge & Iron Co.

Crane bridge at Norfolk navy yard, 350 tons, to American Bridge Co.

Double tracking on Virginian railway, 1,100 tons, to independent fabricator.

CONTRACTS PENDING.

Municipal pier, Norfolk, Va., 500 tons, bids being taken.

Russia Places Car Orders

Divides 10,000 Between Two Builders—Locomotive Builders Have Difficulty to Get Plate Quotations—Rails Sell at $70

New York, May 29. (By wire.)—Contracts covering 10,000 cars for the Russian government have been awarded to the American Car & Foundry Co. and the Standard Steel Car Co., it is announced today. These cars have been pending for some weeks. They will be four-wheeled cars of about three tons capacity each, and the steel requirements will not be large.

New York, May 29. — Locomotive builders are encountering more difficulty in obtaining plate quotations to cover large inquiries now pending for Russia and for some domestic systems. Some of the larger producers, in view of the government's requirements for ship steel, have declined to make any quotations on plates for these orders. They are making some prices on shapes and bars, but not for delivery this side of Jan. 1, 1918. In view of these conditions, the large Russian purchase, which may run to 1,000 locomotives, still is deferred and no action yet has been taken by the New York Central on its large lot. The Northern Pacific has ordered 40 locomotives from the American Locomotive Co., and the British war office, 50 six-wheel engines from the Baldwin Locomotive Works. The Pennsylvania lines west are having 30 passenger locomotives built in the Altoona shops.

Rails Sell at $70

Philadelphia, May 29.—Open hearth rails in small lots have been sold to industrial companies by eastern producers at $70, mill. These transactions have called for quantities of only a few hundred tons.

Semi-Finished

Sought by Munition Makers—Foreign Demand is Heavy

Pittsburgh, May 29.—Manufacturers of sheets, tin plate, cold rolled strip steel and other products made from billets and sheet bars, are making arrangements for third quarter and in many instances fourth quarter requirements. With sheet bars selling at as high as $110 a ton at the mill for early shipment, it is not unlikely that consumers will pay approximately $100 a ton for both billets and sheet bars for extended delivery. Heavy demand exists for semi-finished products for shipment abroad, and munition makers in this country quietly are negotiating for large quantities of forging billets, which are held at $115 a ton. Wire rods are quoted at as high as $95 a ton by some makers. Muck bar is listed at $70, Pittsburgh.

(*For miscellaneous prices see page* 1210)

May Roll Scrap Sheets

Cleveland, May 29.—Increased scarcity of both bessemer and open hearth sheet bars is anticipated by sheet makers who are obliged to buy their supplies in the open market. Some of them are considering resorting to the methods of years past and of resuming the rolling of sheets from steel scrap. This practice would tend to help out the situation in flat sheets at least. No further sales of open hearth bars have been made in this territory since the recent transaction at $110, mill. One maker will not quote below that figure but has little early material to offer.

Discards Bring $55

Philadelphia, May 29.—Shell steel discards of special analysis have been sold in this territory at $55, Ohio mill. One eastern maker now is quoting open hearth rerolling billets at $100, mill.

Strip Steel Rise Effective

Pittsburgh, May 29.—Strip steel makers have experienced no difficulty establishing the recent advance in prices of $5 a ton. For delivery at the convenience of the maker, material is being offered at 8c to 8.25c, base. Demand is described as extremely heavy.

Steel Companies Are Sued Under Slag Ruling

Formal suits growing out of the slag disposal decision of the interstate commerce commission have been filed in federal district court at Cleveland by the Baltimore & Ohio, Pittsburgh & Lake Erie, Erie, Pennsylvania and New York Central lines against a number of iron and steel companies in eastern Ohio, claiming an aggregate of $149,338 on deferred freight charges. The companies named as defendants include: Youngstown Iron & Steel Co., A. M. Byers Co., Standard Slag Co., Ohio Iron & Steel Co., Struthers Furnace Co., McKeefrey Iron Co., Youngstown Sheet & Tube Co. and the Brier Hill Steel Co.

Allot Plates For Ships

Chicago Mills Receive 15,000 Tons For Pacific Coast Work—Continue to Quote 8.50c For Tank—Refuse 8.00c

Chicago, May 29.—Offers of 8c for tank plates are being made without success. The same has been true of offers at 7.40c and 7.50c. Apparently sales for delivery in three months, on which these offers are made, can be made only at the expense of previous buyers. The mills are hewing to the line, especially in view of the inevitable delays that are incident to immediate compliance with the requirements of the government. The leading western maker has been allotted about 15,000 tons of plates for eight ships to be built by the Los Angeles Ship Building & Dry Dock Co., under orders of the government. About 10,000 tons of shapes for the same work goes with the plates. An inquiry, not yet placed, calls for 2,000 tons of bars and 100 tons of ship plates for 10 wooden ships to be built by the Standifer Clarkson Ship Yards on the Pacific coast.

Domestic Consumers Retrench

Pittsburgh, May 29.—Domestic consumers, uncertain about the future and somewhat discouraged because of the scarcity and high prices of material for nearby shipment, are retrenching. Specifications against contracts have fallen off appreciably during the last fortnight and scarcely any new business is enjoyed. With several of the larger mills devoting fully 75 per cent of their capacity to government work, many consumers have been forced to pay 7.50c and above for material which they had contracted for previously at as low as 3.50c. Men who attended the meeting of the American Iron and Steel Institute at New York last week, learned in a definite manner, that the government and its allies will be active factors in the market for ship steel for many months. Demands of ship builders likely will increase constantly over the remainder of the year. The Carnegie Steel Co. nominally quotes plates at 4.50c, but no material has been sold at less than 7c recently.

Advance Tanks to 10c

Philadelphia, May 29.—An important eastern Pennsylvania maker, effective today, has advanced his minimum on tank plates to 10c, Pittsburgh, or 10.159c, Philadelphia. This maker during the week sold 5,000 tons of Lloyd ship plates at 10 cents, Pittsburgh. Railroads are coming into the market for material for considerable equipment to be built in their own shops. The Pennsylvania railroad has inquired for about 5,000 tons on tank plates for cars to be built at Altoona. This system has placed 2,500 tons of shapes and bars for this purpose. The Norfolk & Western railroad is negotiating for the steel for 2,000 to 4,000 cars.

Another avalanche of tonnage rained down on the plate makers during the past week, but in practically all cases business was refused. The mills more and more are confining themselves to regular customers. Inquiry for contracts for last half or third quarter increases daily, but the mills are discouraging and in most cases declining such business. Among inquiries of the week was one for 15,000 tons accompanied by the declaration that the buyer was "willing to pay fancy prices". This offer did not bring forth a single quotation. Instead of the salesmen visiting the trade, mill officers are frequented by purchasing agents from all over the country, pleading for acceptance of their orders.

Group Structural Shops

New York, May 29.—Plans are being well advanced for co-ordinating the fabricating shops of the country to produce sections for standard designs of ships and thereby make possible the achievement of the government's program of 3,000,000 tons of shipping within 18 months. A purchase of 80 acres of land with an option on an adjoining tract in the Hackensack, N. J., meadows fronting on Newark bay by the American Bridge Co., officially announced during the week, is believed to be in furtherance of this project. This land probably will be made the site for a large assembling plant for putting together ship sections fabricated in various interior shops. Chairman Gary, of the Steel Corporation, states, however, full plans have not been determined. Similar plans are understood to be maturing in other directions. Independent shops have been signifying their willingness to take on work for standard ships. At latest reports, it is believed the program will call for about 2,500,000 tons of steel and about 500,000 tons of wooden ships. This would require approximately 1,000,000 tons of rolled steel.

Will Take Ship Tonnage

Cleveland, May 29.—Eastern Pennsylvania makers quoted tank plates for delivery in this territory this week at 8.50c, mill, or 8.709c, Cleveland, shipment within several months. Fabricating shops in this district have been manifesting their willingness to take on tonnage for standardized ship construction for the government up to 33 1/3 and 50 per cent of their capacity.

(*For miscellaneous prices see page* 1210)

Ignore Inquiries

Because of Filled Condition of Pipe Mills—Cast for War Use

Pittsburgh, May 29.—Because of the sold-up condition of mills, iron and steel pipe makers generally are paying no attention to inquiries, which would command considerable interest during more normal times. Many of the larger tube mills have withdrawn from the market. An independent refinery interest has entered the market for 3,700 tons of miscellaneous sizes of steel pipe for southwestern shipment. This inquiry includes 30 miles of 6-inch line pipe. The boiler tube market, from a purely domestic standpoint, is a closed book. However, merchant and marine boiler makers working on government contracts are experiencing no difficulty in obtaining their requirements.

Market Remains Dull

Chicago, May 29.—Continued absence of buying of cast iron pipe by municipalities makes the market dull. Except for industrial demands and specials and the expected requirements of the government for military camp use, little business is coming out. Bids will be opened June 1 by Akron, O., on 225 tons.

Small Orders Prevail

Birmingham, May 29.—Cast iron pipe plants in the Birmingham district are melting in good volume and shipments are steady. Small specifications are most active and make a fair aggregate. But little business has been received so far from the government and this has been mainly for use at navy yards. The United States Cast Iron Pipe & Foundry Co. is filling an order for 800 tons for the army camp at Chattanooga.

Foundries and machine shops in the Birmingham district are feeling some effects of the business being placed by the government, though no statements are given out as to what is being done. Labor with the pipe plants, foundries and machine shops appears better satisfied.

M. Cochrane Armour, of Rogers, Brown & Co., has returned to Chicago from California, where he has been spending the winter.

Scrap Breaks All Records

Under Purchases From Leading Chicago Purchaser, Prices Reach Historic Levels—Excited in West, Calm Elsewhere

Chicago, May 29.—Such abrupt advances and so high a level of scrap prices have never appeared before in the history of the trade. The impelling cause of the advance is a real shortage of material. Under this condition, the strong demand from all consumers has forced prices to points beyond the wildest imagination. Heavy buying by the leading steelmaker is being followed by similar action by other consumers and the demand is increasing daily. Rerolling rails are quoted at $41.50 to $42, heavy melting steel at $32.50 to $33 and railroad wrought at $33.50 to $37 for the various grades. Lack of gondolas is forcing the use of box cars, causing added expense for loading and discharging scrap as magnets cannot be used.

Buying Steel for Pittsburgh

New York, May 29.—Much activity has been contributed to the iron and steel scrap market in this district by a big demand from Pittsburgh buyers for heavy melting steel. This has materialized in sales of large tonnages. Prices on this business have shown a material advance and more than $31, delivered, equivalent to about $28.50, New York, has been done and the movement continues. More interest is shown by eastern buyers of steel but they are unwilling to pay anywhere near the prices offered from Pittsburgh. The market generally is active and all grades are moving freely. The supply has tightened and this is reflected by a very independent attitude on the part of sellers with consequent price advances. The only exception is heavy melting steel for eastern delivery.

Pittsburgh Outbids the East

Philadelphia, May 28.—The chief feature of the iron and steel scrap market here is the demand from the Pittsburgh district for heavy melting steel. Large quantities have been bought here for Pittsburgh delivery during the week, at as high as $31.50, delivered, equivalent to $29 to $29.50, Philadelphia. It appears that as high as $32, delivered, now could be obtained without difficulty. In the eastern market, heavy melting steel demand has improved, but prices are much below those being paid by Pittsburgh buyers. All other grades are in good demand, notably wrought pipe, which have sold at $25.50, delivered eastern Pennsylvania. Prices generally continue to move upward. Old steel rails now are quoted at $35 to $37; heavy melting steel at $25.50 to $26.50; low phosphorus at $40 to $42; steel shafting at $36 to $37; car wheels, $30 to $31; No. 1 railroad wrought at $41 to $43; wrought pipe at $25 to $26; cast borings at $16.50 to $17; turnings at $16 to $16.50; No. 1 heavy cast at $31 to $32; malleable at $29 to $30; stove plate at $19 to $19.50; No. 1 forge at $20 to $21; bundled sheets at $20 to $21 and frog switch and guard rails at $25.50 to $26.50.

Pittsburgh Scrap Moves Freely

Pittsburgh, May 29.—Despite heavy pressure for railroad cars, old iron and steel material is moving satisfactorily in western Pennsylvania. Consumers say they are getting all the material they need. Although demand is heavy, prices have not changed much in position this week. Heavy melting material is being held at $30; one consumer, however, purchased 500 tons at $28. Hydraulic compressed sheets have advanced $2 and car wheels have jumped upward $5 this week. Demand for turnings, borings and cast scrap is heavy.

Stocks are Absorbed

Buffalo, May 28. — Dealers of the Buffalo district report a stronger market all along the line. Large sales are being made cleaning up practically all of the scrap stocks of the various classes and there also is an increasing inquiry. Heavy melting steel is now quoted at $29 to $30, an advance of $1 over a week ago. No. 1 railroad wrought has advanced to $39 to $40; low phosphorus to $38 to $40; carwheels to $27.50 to $28.50; clean cast borings to $15 to $15.50; old iron rails to $31 to $32, and wrought pipe now is $18.50 to $19. The trading in all of these grades has been especially active in the past week.

Must Load Cars Fully

Cleveland, May 29. — Excitement rather than activity characterizes the Cleveland old material market. The volume of sales is composed of a large number of small orders which has a tendency to make the market extraordinarily strong. Local buyers in the market are few. Dealers in Cleveland have received a notice from a committee appointed to act with the national council of defense by the American Board of Scrap Iron Dealers to the effect that unless all cars are loaded to capacity, there is a likelihood of an embargo being placed upon individual violators. Prices have advanced slightly.

(*For miscellaneous prices see page* 1210)

Car Scarcity is Factor

Cincinnati, May 28.—Some material advances have been made on scrap and prices still are rising. There is an increasing demand for both wrought and cast scrap, but the chief concern now of the dealers is to get cars. Relaying rails are scarce and are held at higher prices than for many years. Yard stocks are not increasing; on the other hand, they seem to be diminishing.

Market Very Excited

St. Louis, May 26.—An excited condition has existed in the scrap iron and steel market for the past week, and prices have been affected so radically that even dealers are somewhat uneasy. This condition was caused by large purchases in the Chicago market, and to some extent here, by outside interests. Local consumers, however, do not appear over-anxious to enter the market, although their stocks have been low for some time. Railroad offerings continue light and an acute shortage of all grades appears to be developing. The only railroad offerings this week are Chicago, Milwaukee and St. Paul, 2,250 tons; and Boston & Maine railroad, 2,800 tons.

Conflicting Reports in South

Birmingham, May 29. Mixed reports are current regarding the southern scrap iron and steel market. Consumers claim that prices quoted are too high while dealers say they are making sales regularly on this basis. Car wheels have advanced from $20 to $22. Other figures practically are holding their own compared with last week. Dealers report considerable supplies and needs of consumers can be met without trouble.

Record Tonnages

Are Being Asked Against Current Contracts for Tin Plate

Pittsburgh, May 29.—Tin plate makers have withdrawn from the market for delivery the remainder of 1917. Specifications against contracts are heavier than ever before in the history of the industry, say several mill managers. Quotations for prompt and future delivery are held as nominal.

Sell at $9.50 From Stock

Philadelphia, May 29.—Small sales of tin plate from stock lists have been made in this territory at $9.50 per base box, Pittsburgh.

Accept Ship Steel Offer

Gen. Goethals Will Place 3,000,000 Tons With Steel Corporation and Lackawanna Steel Co., Shipping Board Says

Washington, May 29. (By wire.)—Statement is made at offices of United States shipping board that Gen. Goethals has accepted the offer of the Steel Corporation and of the Lacawanna Steel Co. to fabricate 3,000,000 tons of steel ships in 18 months. This would mean approximately 500 vessels of this type, it is estimated. Other steel interests are known to be ready to supply the board with material to speedily execute the program which as now arranged calls for increased number of steel ships. It is believed not over 150 or 200 wooden ships will be built and remainder of upwards of 1,000 or more will be of steel. This brings to an end the difference between Chairman Denman of the shipping board and Gen. Goethals growing out of the latter's statement before the American Iron and Steel Institute last Friday night.

The house late yesterday adopted amendment to urgent deficiency bill carrying $750,000,000 for ships. This follows similar action taken by senate and the measure now is in conference. A house amendment gives authority to the President rather than Gen. Goethals to spend money for ships. Only orders for definite requirements now are being considered.

Submarine Nets

Being Figured On Are Placed in Large Numbers—Wire Selling Stops

Pittsburgh, May 29.—Virtually every manufacturer of wire products has withdrawn from the market. It is not likely that additional domestic orders will be accepted by several of the larger mills until after the government has indicated specifically how much tonnage it requires for war purposes. Heavy tonnage of wire rope are involved in pending negotiations for anti-submarine nets. It is reported additional contracts for nets recently have been placed. Recent orders placed call for many miles of 5-foot mesh nets. The American Steel & Wire Co. has made no change in its prices since March 5 last. Independent makers are quoting material $6 a ton above nominal prices of the leading interest.

Won't Accept Contracts

Philadelphia, May 29.—Some Pittsburgh district makers have decided to take no more wire or wire nail contracts under present conditions.

Propose Canal for Youngstown

Youngstown, May 28.—Steel manufacturers here are urging the immediate canalization of the Beaver and Mahoning rivers between this city and the Ohio river to provide Youngstown and environing territory with much needed additional transportation facilities. The unparelleled volume of freight movements in and out of this city, now at the annual rate of more than 30,000,000 tons, has left existing facilities totally inadequate to cope with the situation under the difficulties presented.

Canalization of these streams as indicated would be in direct line with the project to connect Lake Erie and the Ohio river by a canal, construction of which may be temporarily delayed by the war. Cost of the canalization of the two streams would be in excess of $15,000,000. Improvement of the streams would give Youngstown direct water connections with the coal and coke fields of western Pennsylvania and with the extensive lower Ohio, Mississippi and western territories.

Spot Coke Jumps Again

Sales Are Closed at $9 and $9.50—Last Half Contract Placed at $8.50—Car Supply Poor

Pittsburgh, May 29.—Heavy purchases of blast furnace coke during the week by the Republic Iron & Steel Co., Youngstown, whose by-product ovens were forced to suspend operations May 20, on account of an accident to its power plant, sent prices of blast furnace fuel for prompt delivery to $9, ovens, as a minimum. Sales at as high as $9.50, ovens, were reported today. Quotations on foundry coke have advanced to $10.25, ovens, for prompt delivery. Blast furnace fuel for delivery in the second half is reported to have been sold at $8.50, ovens. The Wisconsin Steel Co. is credited with having taken 12,000 tons a month for the second half. Cokemakers do not plan to suspend operations on Memorial Day, although many coal mines in western Pennsylvania will be shut down. The supply of cars last week was about 53 per cent, compared with 52 per cent the week previous. The supply today is 70 per cent, with prospects of an 80 per cent supply tomorrow. The Pittsburgh & Lake Erie railroad is using coke cars for hauling iron ore from lower lake ports to interior points. This practice is tending to reduce further the number of cars available for coke shipment. Production of coke in the Connellsville fields the week ending May 19, was 360,940 tons, compared with 380,530 tons the week before, according to the *Connellsville Courier*.

Outside Orders Refused

St. Louis, May 26.—Dealers are having trouble to supply their regular customers. Business from outside territory is being refused because of inability to get coke. The car situation, while better than a month ago, is still far from normal, and some of the largest consumers are complaining of backwardness in deliveries. Gas plants in this region are selling fair tonnages for late this year and early 1918, and they are basing sales on the belief that there will be no reduction of present prices for many months. The railroads have announced an increase of 15c a ton on foundry coke freight from the Connellsville district to St. Louis, effective July 1.

Premium Offers Fruitless

Birmingham, May 29.—Continued strength is being shown by the coke market, though the make is being steadily increased. At the same time, consumption is growing. Prices remain firm at $6 to $8 on furnace and at from $10 to $12.50 on foundry coke. Various car lots are being sought, but producers are not in position to take on the business despite the liberal premiums offered. Several contracts of considerable size, running for months, have been offered. Coke makers in the Birmingham district have their output well taken until about July and present contracts will be given preference in the renewals if the new price is acceptable.

The Century Steel Co., of America, New York, is completing a new plant at Poughkeepsie, N. Y., for the manufacture of tool steels. The company expects to be producing about July 1.

(*For miscellaneous prices see page* 1210)

May Limit Ore Shipments

Ore Association May Ask Blast Furnaces to Ship Only Enough Ore to Meet Requirements

The Lake Superior Iron Ore Association has taken definite steps to limit iron ore consumers to actual requirements during the period from May 1, 1917, to June 1, 1918. Realizing that the interests of the nation during the war will be jeopardized seriously unless industrial companies practice economy, the iron ore association is enlisting the cooperation of blast furnace managers to minimize the movement of iron ore this year. Lake and inland blast furnaces have been requested to stipulate: Their actual requirements from May 1, 1917, to June 1, 1918; the amount of ore held at furnaces or on docks May 1, 1917; the amount of ore to be shipped by lake in 1917; the tonnage to be moved by rail, and the amount to be stored on Lake Erie docks.

The Lake Superior Iron Ore Association met at Cleveland May 24, upon the suggestion of C. D. Dyer, vice president, the Shenango Furnace Co., Pittsburgh, who is chairman of the lake shippers' committee. Mr. Dyer after corresponding with G. L. Peck, vice president of the Pennsylvania railroad, who is chairman of the special committee on lake coal and iron ore movement, concluded that shippers and consumers of Lake Superior iron ore should practice economy this year, on account of the war. Mr. Peck advised Mr. Dyer that the government's requirements in other directions might be jeopardized, if iron ore consumers in 1917 followed the practice of storing material to provide against future exigencies in the way of labor troubles or transportation shortage.

As soon as the actual requirements of ore consumers from May 1, 1917, to June 1, 1918, are compiled, this information will be turned over to Fairfax Harrison, chairman of the executive committee of the American Railway Association, which is working in conjunction with the council of national defense, to solve transportation problems.

The lake shippers committee, of which Mr. Dyer is chairman, likely will be merged with the subcommittee on national defense in charge of iron ore, pig iron and lake transportation, headed by H. G. Dalton, Pickands, Mather & Co., Cleveland.

The Imperial Belting Co., Lincoln and Kinzie streets, Chicago, has taken over the 4-story fireproof building adjoining its present plant. This addition will double the factory space and was made necessary by the increased amount of business being handled by the company. Most of the new machinery is on the ground and the new plant will probably be placed in operation during the current month.

Price of Government Ship Steel to be Higher

Washington, May 29.—That prices for structural steel for merchant vessels to be built under the direction of the United States shipping board will probably be higher than those applying to similar material for the war and navy departments was the statement made to *The Iron Trade Review* by Theodore Brent, a member of the board. Mr. Brent said until it was determined how many steel or wooden ships will be built, the tonnage of steel required could not be estimated. He confirmed statements heretofore made in that steel manufacturers had assured the board of a sufficient supply of structural material, and had offered to deliver 400,000 tons a month after six months. Maj. Gen. George W. Goethals, before the American Iron and Steel Institute said President James A. Farrell of the Steel Corporation speaking in behalf of the whole industry had given assurance of an adequate supply of steel for the ships.

The price of the steel, Mr. Brent said, has been discussed, but had not been settled. He expressed the belief, however, that higher prices would have to be paid for the tonnage for the merchant ships than the 2.90c and 2.50c granted to the war and navy departments. While the ship builders, Mr. Brent said, will probably arrange to buy the steel from the producers, it is likely that it will be distributed through a committee, probably through the committee of the Institute, directing the supplying of navy and war department needs.

Controversy Grows Over Steel on Wood Ships

Washington, May 29.—Differences between Chairman Denman, of the shipping board, and Gen. Goethals, manager of construction of the emergency merchant fleet, is attracting wide attention. For some time Gen. Goethals has been urging the abandonment of the plan to build wooden ships as far as possible, and that the efforts of the shipping board be directed to the construction of steel ships. This has met with the disapproval of Chairman Denman and of certain other members of the board. Gen. Goethals is said finally to have won over board members to his view. The reply of Chairman Denman to Gen. Goethals' remarks before the American Iron and Steel Institute at New York, Friday, indicates however that the breach has widened and may result in President Wilson forcing the chairman if not other members off the board or compel submission to the Goethals plan. The latter, it is believed, is ready to resign before attempting to build a large number of wooden ships. Chairman Denman's remark that "we believe that the committees of congress and not a public dinner with the head of the steel trust, are the places for discussion of mtaters of policy with regard to ship building," is taken to foreshadow a sharp controversy which is likely to have its airing in congress. It is believed the Panama canal builder has a stronger backing than the shipping board chairman.

Chairman Fitzgerald, of the appropriation committee, stated that Gen. Goethals had told the committee he thought the number of wooden ships would necessarily be limited to 150 to 200

(For miscellaneous prices see page 1210)

Westinghouse Profits in 1916 Were Large

A net income of $18,079,889, equal to 30.2 per cent on the outstanding stock, is shown in the annual report of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for the year ending March 31. This compares with a net income of $9,666,789 in 1916. Gross earnings for the year amount to $89,539,442. Completed orders for munitions contributed largely to the results of the year although both the sales and the profits from the regular products of the company were at record levels. The financial statements for the last two years is given in the following table:

	1917.	1916.
Gross earn.	$89,539,442	$50,269,240
Cost sales	72,077,752	40,839,344
Net profit	17,461,690	9,429,896
Other inc.	1,386,547	1,106,730
Gross inc.	18,848,237	10,536,626
Int. chgs	768,348	869,837
Net inc.	18,079,889	9,666,789
Prfd. divs.	279,909	279,909
Com. divs.	3,750,000	2,526,951
Surplus	14,049,980	6,859,929
Adj. credit	.....	26,296
Prev. surp.	9,246,707	7,473,412
Total surp.	$23,296,687	$14,359,637
Reserve	5,000,000	.....
Dep. of inv.	.....	3,769,057
Misc. deduc.	191,388	1,343,873
P. & L. su.	$18,105,299	$9,246,707

Men of the Iron Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

ROBERT RADFORD on May 10 became president of the Southwark Foundry & Machine Co., Philadelphia, succeeding W. L. Abbott. Mr. Radford began his business career with the Baldwin Locomotive Works in 1894 and ever since promotions have come to him rapidly. For the past few years he has filled the office of secretary-treasurer of the Standard Steel Works Co., Philadelphia, with plants at Burnham, Pa., and will continue in this capacity. Mr. Radford graduated form Girard college with the class of 1894 and now is president of the Girard College Alumni Association.

Keith R. Rodney recently has joined the staff of the Bullard Machine Tool Co., Bridgeport, Conn., as metallurgist and special counselor in the selection and treatment of steels. Mr. Rodney formerly was with the Midvale Steel & Ordnance Co., and later with the Winchester Repeating Arms Co., New Haven, Conn., for two years, as superintendent of the heat-treating department.

J. A. Lovington, of the engineering department of the American Ore Reclamation Co., New York, has joined the officers' training camp at Plattsburg, N. Y. He holds a commission as second lieutenant in the Engineers' Reserve Corps, and he was formerly a member of the Twenty-second Regiment of Engineers, New York City.

Thomas Morrison, Pittsburgh, director of the United States Steel Corporation, and Charles Hayden, of Hayden, Stone & Co., have been chosen directors of the International Nickel Co., to complete the terms of Col. R. M. Thompson and S. H. P. Pell. W. T. Graham succeeds Col. Thompson on the executive committee.

Ray Middleton, identified with the Detroit Steel Products Co., Detroit, Mich., is one of the four American auto drivers picked to pilot the machines General Pershing and his staff will use on the western battle front of Europe.

J. R. Stroh has been appointed assistant general manager of mining and transportation of the Brier Hill Steel Co., Youngstown, a newly created position. Mr. Stroh has been with the Brier Hill company about five years, coming to that company from St. Louis. He will be associated in his work with J. N. Allen, general manager of mining and transportation.

F. H. Tackaberry, until recently of the Ordnance Engineering Co. of America, 120 Broadway, New York,

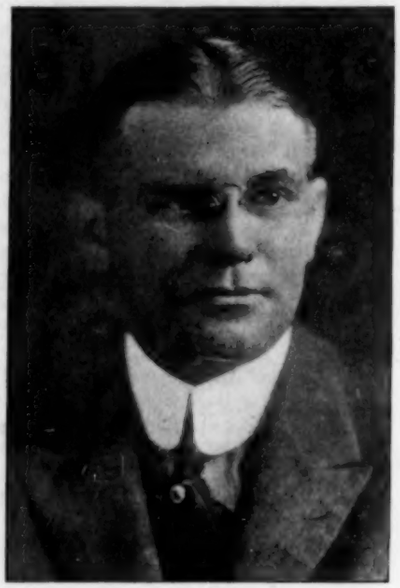


Photo by Marceau

ROBERT RADFORD

has become associated with the American Steel Export Co., New York, and will travel in South America. Mr. Tackaberry for a number of years was connected with the Pennsylvania Steel Co., last serving in the general sales department at Philadelphia.

Col. C. Vincent Massey and A. S. Patterson have been elected directors of the Massey-Harris Co., agricultural implement manufacturer, Toronto. A. S. Patterson is now on his way homeward from Australia, and it is understood that on his return he will be appointed general sales manager of the company.

I. S. Fouse, formerly associated with the Standard Steel Car Co., Pittsburgh, with works at Butler, Pa., now is general manager of the Allegheny Foundry & Machine Co., Glassmere, Pa.

B. M. W. Hanson, vice president and works manager of the Pratt & Whitney Co., Hartford, Conn., has been appointed chairman of a subcommittee of the general munitions board on machine guns by the council of national defense in Washington,

A. C. Prugh, of Leechburg, Pa., has been named superintendent of the Mahoning Valley Steel Co., Niles, O., which has started operations. The company is rolling sheets for the Ford Motor Co. from bars supplied by the latter.

Henry F. Russell, formerly with the Lumen Bearing Co., Buffalo, has been appointed sales manager of the gray iron department of Farrar & Trefts, Inc., Buffalo, N. Y.

H. D. White, president of the Laconia Car Co., Laconia, N. H., has been elected a vice president of the new Tanners' National bank, Woburn, Mass., which will open for business about July 1.

W. W. Llyle, formerly with the Jones & Laughlin Steel Co., Pittsburgh, is superintendent of the rod and blooming mills of the Keystone Steel & Wire Co., Peoria, Ill.

E. L. Morris, for many years secretary-treasurer of the Sloss-Sheffield Steel & Iron Co., has become auditor of the Birmingham-Trussville Iron Co., Birmingham, Ala.

Harry D. Sarge has resigned his connection with the sales department of the American Iron & Steel Mfg. Co. plant of the Bethlehem Steel Co., Lebanon, Pa.

C. J. McIntosh, president of the Federal Bridge & Structural Co., Waukesha, Wis., and Frank McLaughlin, an engineer for the same company, hold commissions in the quartermaster officers' reserve corps.

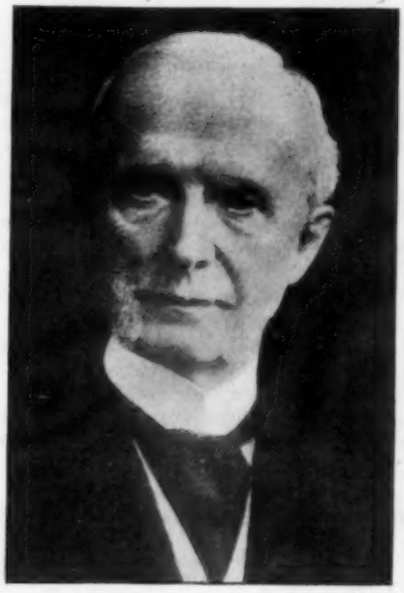
E. T. Sproull has been advanced to the general managership of sales of the Trumbull Steel Co., Warren, O., succeeding A. N. Flora, who recently was elected vice president of the company. Mr. Flora also was elected to the board of directors, succeeding D. W. Kerr, who resigned after purchasing the interest of the Trumbull Steel Co. in the Fort Smith Spelter Co., Fort Smith, Ark.

Charles R. Holton has been made

assistant purchasing agent of the Bethlehem Steel Co., South Bethlehem, Pa. For the past year Mr. Holton has been an assistant to W. M. Tobias, purchasing agent of the Bethlehem Steel Co.

W. S. Tyler, Cleveland Wire Manufacturer Dies

Washington S. Tyler, 82, founder of the W. S. Tyler Co., Cleveland, died suddenly, May 27. He was one of the pioneer manufacturers of Cleveland. He organized the W. S. Tyler Wire Works in 1872, from which the present company, employing about 1,100 men, has grown. Mr. Tyler was born in Ohio City, O., and was



WASHINGTON S. TYLER

educated in the public schools of Connecticut. He came to Cleveland when 16 years old to enter the firm of E. I. Baldwin & Co., where he worked his way up to a partnership. As an employer, Mr. Tyler was admired and respected for his fairness and benevolence. He was a trustee of the Children's Aid Society, Lakeside hospital and a member of the governing boards of Western Reserve University, Workingmen's Loan Association and other similar institutions. He was also a director of the National Commercial bank, Cleveland, and a member of the Union and Clifton clubs.

Frederick E. Aubel, died at his home in Philadelphia, Pa., aged 57. Mr. Aubel was born in Philadelphia and in 1889 with his brother Emil Aubel, engaged in the manufacture of structural iron.

Report Reflects Changes in Prices and Wages

How quotations on sheet metal products, wages of mill crews and prices on metals entering into the manufacture of sheets have changed since December, 1915, is reflected by the accompanying report recently completed by the National Association of Sheet & Tin Plate Manufacturers, of which Walter W. Lower is secretary.

For computation purposes, prices and wages in effect in December, 1915, are listed at 100 per cent. Changes in wages and selling prices are given for each month in 1916 and the first five months of 1917. In 1916, the report shows that wages of mill employes increased as follows: Hot mill men, 32.20 per cent; common labor, 57.12 per cent; quotations on metals advanced as follows: Sheet bars, 78.10 per cent; black sheets, 73.90 per cent; blue annealed sheets, 71 per cent; galvanized sheets, 32 per cent. The price on spelter decreased from 100 per cent to 66.44 per cent. The following advances were made up to May 15, last: Hot mill men, 71.70 per cent; common labor, 71.41 per cent; sheet bars, 203.05 per cent; black sheets, 179.50 per cent; blue annealed sheets, 209.75 per cent; galvanized sheets, 91 per cent. The price of spelter decreased from 100 per cent to 55.32 per cent. It will be recalled, however, that quotations on spelter advanced to unprecedentedly high levels, a short time after the outbreak of the war in Europe.

The report shows that since December, 1915, sheet bars have advanced from $33 to $100; black sheets, from 2.53c to 7.07c; galvanized sheets, 4.75c to 9.07c; blue annealed sheets, from 2.26c to 7c; hot mill labor, from $9.093 to $15.618 per net ton; common labor, from 17½ cents to 30 cents an hour. At the last bi-monthly examination of sales sheets conducted by the Amalgamated Association of Iron, Steel and Tin Workers and manufacturers, the actual invoiced sales average price of Nos. 26, 27 and 28 gage bessemer black steel sheets was found to be 3.90c.

English Output Expands

English pig iron production substantially increased in 1916 under war pressure. The 1916 output was 9,047,983 tons, compared with 8,793,659 tons in 1915. These figures include forge, foundry, basic, spiegeleisen, etc. They were forwarded by Consul General Skinner.

Roll Rails at Sidney

Frank Cochrane, Dominion minister of railways, states that the steel rails required for renewals on the Intercolonial railway will be rolled at Sydney, N. S.

PER CENT OF ADVANCE IN PRICES—MAY 15, 1917.

Based on Prices December, 1915: Equaling 100 Per Cent.

	—Labor—		—Metals—				
1915.	Hot mill.	Common.	Sheet bars.	Black sheets.	Blue anld. sheets.	Galv. sheets.	Spelter.
Dec.	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1916.							
Jan.	103.45	111.41	107.60	102.78	112.82	100.00	107.70
Feb.	103.45	111.41	112.12	102.78	117.25	101.05	119.15
Mar.	111.99	114.30	125.75	107.90	126.10	103.80	107.15
Apr.	111.99	128.58	136.38	114.23	130.50	105.25	110.30
May	120.60	142.85	130.30	114.62	132.75	105.25	94.24
June	120.60	142.85	128.80	114.62	132.75	101.05	75.45
July	127.10	142.85	134.85	114.62	128.32	92.62	56.98
Aug.	127.10	142.85	140.90	114.62	128.32	88.41	53.35
Sep.	130.40	142.85	136.38	115.00	128.32	88.41	54.19
Oct.	130.40	142.85	145.45	127.65	139.40	94.75	58.80
Nov.	132.20	142.85	163.65	147.05	149.10	112.42	70.28
Dec.	132.20	157.12	178.10	173.90	171.00	132.00	66.44
1917.							
Jan.	133.70	157.12	197.00	197.65	210.20	142.10	59.06
Feb.	133.70	157.12	204.55	207.50	210.20	145.25	62.80
Mar.	153.90	157.12	227.30	222.15	239.80	157.90	64.30
Apr.	153.90	157.12	257.60	261.70	281.90	181.50	56.09
May	171.70	171.41	303.05	279.50	309.75	191.00	55.32

SELLING PRICES.

December, 1915.		May 15, 1917.	
Sheet bars	$33.00	Sheet bars	$100.00
Black sheets	2.53	Black sheets	7.07
Galvanized sheets	4.75	Galvanized sheets	9.07
Blue annealed	2.26	Blue annealed	7.00
Spelter	16.72	Spelter	9.25
Hot mill labor	9.093	Hot mill labor	15.618
Common labor, per hour	.175	Common labor, per hour	.30

At the present price of Black Sheets, viz.: $7.07, the Hot Mill Labor will increase to approximately $25.22 per ton: Equaling 177.35 per cent over December, 1915.

Toluol Leads

In Market Demand and Further Government Buying Awarded

New York, May 29.—Most of the demand in coal tar products during the week has been for toluol. Makers are averse, however, to accepting further contracts due to the uncertainty as to what further quantities will be required for trinitrotoluol for the government. Developments with regard to government requirements are proceeding slowly but it is expected that large additional quantities of toluol will be needed. Owing to the extensive contracts already placed and the certainty that the government's wants will result in further contracting in the near future, the supply of this product is regarded as completely taken up for an indefinite period. The market continues very strong. Spot toluol is quoted at $1.75 to $2 per gallon, and contract nominally at $1.50 to $1.75.

Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.	
Pure benzol	$0.55 to .60
Toluol	1.75 to 2.00
Solvent naphtha	.18 to .25
Per Pound at Producers Plant.	
Phenol	$0.45
Per 100 Pounds at Seaboard.	
Sulphate of ammonia	$4.75 to 4.85

Contract.

Per Gallon at Producers Plant	
Pure benzol	$0.55 to .60
Toluol	1.50 to 1.75
Solvent naphtha	.18 to .22
Per Pound at Producers Plant.	
Phenol (nominal)	$0.45
Per 100 Pounds at Seaboard.	
Sulphate of ammonia	$4.40 to 4.50

Sales are limited to small quantities for spot shipment.

Foreign benzol requirements of large size which have been under negotiation are being held up by awaiting the method finally to be adopted for purchasing supplies in this country for the allies. The market has been comparatively quiet this week. The supply continues adequate to all present needs. Pure benzol continues to be quoted at 55 to 60 cents per gallon, at producers' plant, both for spot and contract.

Phenol is in the same situation as benzol since action on large quantities for export also are being held up pending the perfection of purchasing arrangements. The supply of phenol continues adequate. Spot is quoted at 40 to 45 cents per pound. Contract is nominal. Solvent naphtha has been characterized by an improved demand; definite tendency toward strength, however, still is lacking. Spot is quoted at 18 to 25 cents per gallon, and at 18 to 22 cents for contract.

Further contract buying of fairly large proportions, of sulphate of ammonia for delivery over the coming 12 months, has again featured the market. The larger proportion of the business which has been under negotiation for delivery over the next year now has been placed. The contracts placed take up a large proportion of the coming year's output so that the leading producers find themselves with a satisfactory backlog. Demand for spot has been limited. The supply is very meager. Spot holds at $4.75 to $4.85 per 100 pounds, at seaboard, and contract at $4.40 to $4.50.

Affirm and Deny Sale of Thompson Equities

A reported purchase by the Northern Pacific of the equities of the J. V. Thompson coal lands in the Connellsville region is denied by J. M. Hannaford, president of the road, although he and Louis W. Hill, president of the Great Northern railroad, admit that the purchase has been under consideration. The creditors' committee has announced that it has completed such a deal with the Hill interests in the Northern Pacific railroad. The terms of the agreement as announced by the creditor's committee, shows that unsecured claims will be sold for $5,000,000, or 40 per cent of their full amount. Taxes and interest on secured claims, amounting to $2,600,000, will be paid by the syndicate upon the extension of secured claims for a period of three years.

Another Furnace

Rolling Mill and Other Extensions Placed by Brier Hill

Pittsburgh, May 29. (By wire.)—The Brier Hill Steel Co., Youngstown, has awarded the contract for another blast furnace, rolling mill, power and boiler house. The McClintic-Marshall Co. will furnish 5,000 tons for the rolling mill building, power station and boiler house. Contract for blast furnace, which will have a capacity of 500 tons, awarded to the Ritter-Conley Mfg. Co. Semi-finished consumers say sheet bars are not available for less than $100, mill. Cautious buyer has just bought 1,000 tons of bessemer sheet bars at that figure. Open hearth is even higher than bessemer.

Organize New Foundry

The Beckemyer Foundry Co. has been organized at Beckemyer, Ill., with a capital of $8,000 to engage in the operation of a foundry for the production of gray iron, semi-steel, brass and aluminum castings. A plant now is being erected, the main building of which will be 60 x 100 feet. The incorporators are H. O. Briefield and W. L. Timmons, while W. G. Keller has been appointed general manager and superintendent.

The Bethlehem Steel Co. is dismantling the iron ore roaster at its Colebrook plant at Lebanon, Pa.

The Non-Ferrous Metals

Copper Lead Spelter Tin

New York, May 27.—Owing to the holiday Wednesday in the American markets and the Whitsuntide holidays in England, trading in metals is extremely inactive this week. Uncertainty as to steps the government will take continues to exert a rather repressing influence upon business. Spelter is exceedingly dull. Nearby spelter still is obtainable at a discount over more advanced deliveries, owing to forced sales by some of the smaller producers, as well as to unloading of stocks by speculators. Prime western quotations follow: Prompt, 9.25c to 9.37c, St. Louis; June and July, 9.37½c to 9.50c. Brass special is quoted about 10c to 10.25c for prompt shipment.

The copper market has shown signs of a slightly improved demand on the part of consumers and producers now report they are almost sold up for August. Electrolytic quotations follow: Prompt, 33c, on the basis of cash, New York; June, 32.50c; July, 31.50c; August, 30c to 30.50c; September, 29.50c to 30c. Lake copper continues quoted nominally 32c to 32.50c. Casting copper is slightly stronger, prompt now being held at about 31c, cash New York, and June at about 30.25c to 30.50c.

Carload sales of lead for June delivery in the east have been made on the basis of 11.80c, New York, but this price is somewhat higher than the general market. Some producers today are offering metal to their regular customers at around 11c, St. Louis, for June delivery. Lead quotations follow: Prompt and June, 11c to 11.25c; July, St. Louis; 10.75c to 10.87½c.

The antimony market has reflected decreased activity following the heavy trading of a week and more ago. Despite the absence of consumers from the market, prices are holding firmly, largely because of constantly increasing costs. Spot antimony is being sold at around 23c to 24c, duty paid, New York.

Spot Straits tin is quoted around 65c in the New York market, with few sales reported.

The aluminum market is quiet with No. 1 virgin quoted 62c to 64c; No. 1 remelted, 98 to 99 per cent, 58c to 60c; No. 12 alloy, 42c to 44c.

(For miscellaneous prices see page 1210)

New Tide Water Tin Plate Plant

Description of Works Now Being Built By Bethlehem Steel Co. at Sparrows Point, Md.—Initial Unit Will Have Annual Output of 1,000,000 Boxes—Electric Drive Throughout

THE new tin plate plant now being built by the Bethlehem Steel Co. at Sparrows Point, Md., near Baltimore, is rapidly nearing completion and it is expected that the first unit will be ready for operation by July 1. This plant forms part of the tremendous construction program recently undertaken by the Bethlehem Steel Co. in various sections of the country. The new tin plate works, which is being constructed in conjunction with other improvements at the Sparrows Point plant formerly operated by the Maryland Steel Co., will form another link in the ever-growing chain of steel products manufactured by the Bethlehem company. On account of their strong position in the industry, it is but natural that the Bethlehem interests should wish to add a tin plate department in order to further diversify their business.

Initial Unit to be Half of Ultimate

The new tin plate plant at Sparrows Point also will form an important addition to the tinning capacity of the country, which is generally considered inadequate at the present time. The Sparrows Point plant is laid out for an eventual production of 2,000,000 base boxes annually. The initial unit of 12 mills now nearing completion will absorb half of the ultimate capacity; in other words, the plant will commence operations with a monthly capacity of 5,000 tons, equivalent approximately to 1,000,000 base boxes of tin plate per year. The plant provides for the eventual installation of 24 mills.

The new plant, which covers 12 acres, is situated at a convenient distance from the main works at Sparrows Point. The buildings, which are of structural steel and brick throughout, were fabricated by the Riter-Conley Mfg. Co., Pittsburgh. All of the structures are permanent and fireproof. The roof, which is of the Aiken type, with high and low bays, is fireproof and is so designed as to admit an abundance of light and air. The doors are of the rolling type and the windows are fitted with heavy wire ribbed glass.

There are four main buildings, the general arrangement of which is shown in Fig. 3. The bar shed, which contains a 15-ton traveling crane and adjoins the hot mill building, is 70 feet wide and 280 feet long. It is of open side construction to permit easy handling of the incoming raw material. The hot mill building is 147 feet wide and 980 feet long. The building containing the annealing, cold rolling and pickling departments, is 115 feet wide and 756 feet long. It joins the tinhouse and tin supply building which is 66 feet wide and 840 feet in length. The assorting room, which is parallel to the tinhouse, is 100 feet wide and 840 feet long. The various departments are so arranged that the work progresses steadily through the plant without doubling back at any point. The general flow of the work through the plant may be determined by studying Fig. 3. The tin bars, which form the raw material, will be rolled at the main plant at Sparrows Point and delivered to the tin plate plant by means of standard gage railroad cars. In addition to the main buildings just described there are large machine, blacksmith and carpenter shops, together with a store house, garage, office building, etc. These buildings are of the same general construction as the main buildings. The office building, which in itself cost $40,000, has been carefully laid out and provided with complete facilities for transacting all of the business of the tin plate department.

Future Extensions Provided For

Although only 12 mills are being installed at present, the buildings, foundations, etc., have been completed for the eventual 24-mill layout, so that the required extensions can be made in the future simply by installing the machinery, without the necessity for any additional building or other construction work of a permanent character.

Each mill is equipped with three furnaces, including one pair furnace and two sheet furnaces. It is believed this arrangement, which is rather unusual, will facilitate the handling of the product. The plant is so arranged that it will not be necessary to pile any bars up in front of the furnaces, between the furnaces and the mills.

The sheet and pair furnaces were furnished by the George J. Hagan Co., Pittsburgh. They are of stand-

FIG. 1—EXTERIOR VIEW OF ONE OF THE BUILDINGS AT SPARROWS POINT TIN PLATE PLANT OF BETHLEHEM STEEL CO.

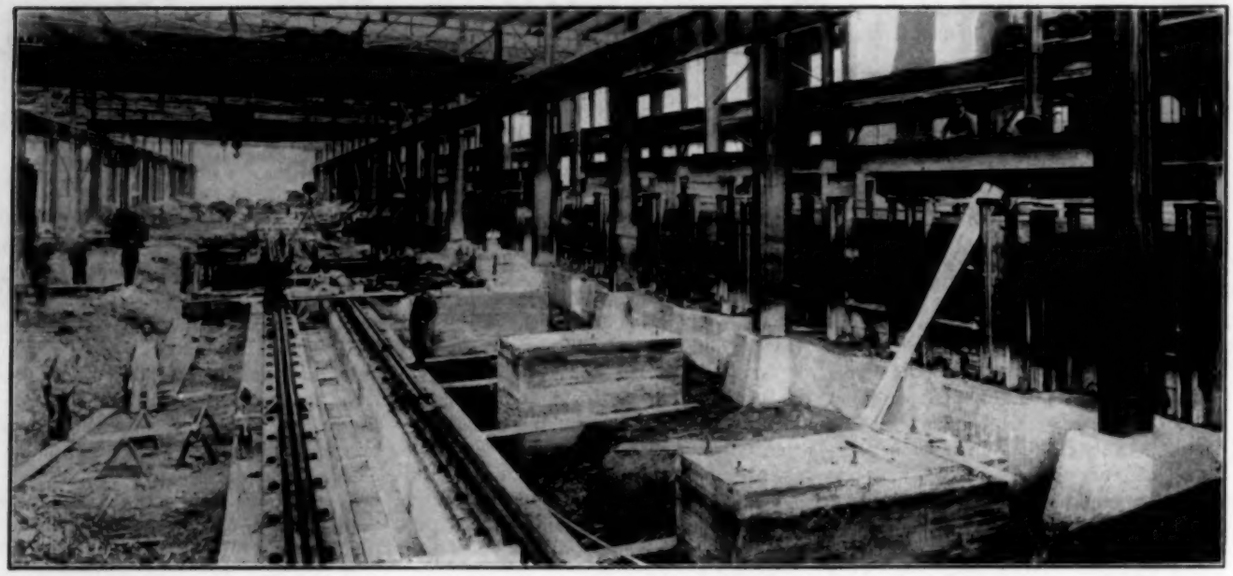


FIG. 2—INTERIOR SHOWING HOT MILL AND SHEAR FOUNDATIONS WITH SHEET AND PAIR FURNACES AT THE RIGHT

ard design, coal burning, and are equipped with American automatic stokers. The bars are charged with a motor-driven Ellis-type charger. The furnaces, which are arranged in a row alongside the charging bay, are served by 10-ton electric traveling cranes built by Pawling & Harnischfeger Co., Milwaukee. This company furnished all of the cranes installed throughout the plant. The arrangement of the furnaces, coupled with the automatic electric charger, makes it possible to handle the cut sheet bars at minimum expense. The fuel for the furnaces is handled by a coal hoist.

Hot Mills are Massive

The hot mills, which were built by the National Roll & Foundry Co., Avonmore, Pa., are provided with cast iron housings weighing 17 tons. The 12 mills are arranged on 28-foot centers in two sets of six with the driving motor in the middle of each train. With this arrangement, it is not necessary to shut down an entire battery of six mills in case anything happens to any particular set of rolls. In such an event, the coupling driving the three mills on one side of the motor is disconnected and the remaining three mills may be kept in operation while the necessary repairs are under way. The rolls, which have 22-inch necks, are 28 inches in diameter and 30 to 34 inches in length. The mills are equipped with water-cooled floors of the latest design. An effective air blower system also has been provided, making the plant one of the coolest in the country. The air blasts are carried to the mills through 6-inch mains. As previously suggested, these mills are divided into two main groups of six, each group being driven by a 1,200-horsepower motor. The two motors, which are of identical construction, were furnished by the Westinghouse Electric & Mfg. Co., Pittsburgh. They are designed to operate on 2,200-volt, 25-cycle alternating current.

For shearing the plates, 12 motor-driven doubling shears and 13 squaring shears have been installed by the Hyde Park Foundry & Machine Co., Hyde Park, Pa. It will be noted there is one extra set of squaring shears. The shears are conveniently arranged near the mills so the material may be cut with a minimum of inconvenience. The main bay containing the hot mills is served by two 25-ton Pawling & Harnischfeger traveling cranes.

The packs are opened in a separate bay situated parallel to the hot mill bay. The opening bay, which extends the full length of the mill building, is 980 feet long and 35 feet in width. As this description indicates, plenty of space has been provided all around the mills and there should be no difficulty from congestion of partially manufactured products, particularly in view of the fact that adequate crane facilities are available in all departments.

The motors are connected to the hot mill spindles by means of cast-steel, cut, helical reduction gears, furnished by the Mesta Machine Co., Pittsburgh. The speed reduction is eight to one, the motor running 240 revolutions per minute and the mill spindles 30 revolutions per minute. The hot mills have also been equipped with Ernest Cronemeyer catchers.

There are five annealing furnaces. Three are for black annealing and two for white annealing. The former are situated in front of the cold rolls near the black pickling department. The two white annealing furnaces are in close proximity to the white pickling department in the rear of the cold rolls. The annealing furnaces are all stoker fired and are provided with Freeman chargers. Only two white annealing furnaces are necessary on account of the shrinkage of the stock which amounts to approximately 20 per cent.

Pickling Department is in Duplicate

The location of the white and black pickling departments is shown in Fig. 3. The pickling equipment, which is in duplicate, consists of two Mesta four-arm machines and one Mesta three-arm machine. The steam for the pickling machines is furnished by a 1,400-horsepower Babcock & Wilcox water-tube boiler. This boiler is located near the cold rolling department. The steam also is used for heating the assorting room and other departments throughout the plant requiring artificial heat in the winter time.

The cold-rolling department is centrally located, as indicated in Fig. 3. It consists of 12 stands of 24 x 36-inch cold rolls driven in tandems of three by a rope drive and a 1,200-horsepower motor. A Wuest herringbone reduction gear is interposed between the motor and the rope pulleys. This gear was furnished by The Falk Co., Milwaukee. The rope drive is inserted in the power transmission system in order to be sure that the sheets

will leave the mill with the most desirable surface possible. It is believed that a rope drive tends to give a better surface to the sheets than a rigid gear drive.

After the white annealing and pickling, the sheets are transferred to the tinhouse by means of electric, motor-driven tractors.

Tin House is Unique

Unusual thought has been given to the design and arrangement of the tinhouse, and it is believed that an exceptionally economical and satisfactory arrangement has been devised. Each tinning machine occupies a separate niche in the tinhouse, directly connected with an individual ventilator. Consequently the most desirable atmospheric conditions are obtained and fresh air is assured at all times. Twenty-one tinning stacks of the latest type have been provided for the first unit of 12 hot mills. The pots are heated by gas supplied from coke ovens at the main plant. The tinning machinery was furnished by the Hyde Park Foundry & Machine Co., Hyde Park, Pa. The tinhouse adjoins the assorting room and the cleaning machines are so placed that the finished tin plate is delivered by conveyors to the center of the assorting room without the use of buggies or trucks. The tinhouse is equipped with a 5-ton electric crane for handling supplies and delivering sheets.

The supplies for the tinhouse are stored in rooms set aside for that purpose immediately adjacent to the tinning machines. These rooms are all so arranged that the materials are handled over as short a distance as possible. The scruff room is equipped with suitable furnaces and the palm-oil room is provided with refining apparatus. The peanut hulls used for cleaning the plates are stored in a specially arranged room, adjacent to which is the pig-tin storage room.

The assorting room, which is 840 x 100 feet, is paved with a wood block floor. A depressed railroad track enters along one side for the convenient shipment of the finished product. Similar tracks enter the other buildings at various points. The assorting room and tinhouse are painted black and white, which gives a very pleasing effect.

The machine shop, which is completely equipped with modern machine tools, opens directly into the tinhouse. It was arranged in this manner because the tinning machinery requires more frequent attention from the repair department than other apparatus, and with the machine shop immediately adjacent, repairs can be effected with a minimum of effort. The machine shop floor is paved with wood blocks.

In the design and arrangement of the plant, the welfare of the employes has been given the utmost consideration. Wherever necessary, adequate heating facilities are provided and those departments subjected to acid fumes are equipped with special ventilating apparatus which keeps the atmosphere cleared. The hot-rolling department and other sections of the plant subjected to unusual heat, are provided with special air-cooling arrangements as previously described. In addition, modern toilet rooms, wash rooms, shower baths and rest rooms are available both for male and female help. A special effort has been made to provide the women workers with attractive and congenial surroundings. The water supply is obtained from deep wells. The initial unit will require the services of approximately 700 employes.

The plant is advantageously situated for export business, being surrounded on three sides by deep water connecting with Chesapeake bay. Rail connections also are provided with all of the eastern coast lines.

Another War Problem

Lieutenant Colonel Chauncey B. Baker, quartermaster corps, United States army, has prepared a statement showing the amount of railroad equipment required to handle government soldiers and army supplies in time of war. According to the statement, to move one field army of 80,000 men, consisting of three infantry divisions, one cavalry division and a brigade, 6,229 cars and 366 locomotives made up into 366 trains are required. The cars would include 2,155 passenger, 385 baggage, 1,055 box, 1,899 stock and 775 flat cars. It is pointed out that this equipment represents 0.7 of 1 per cent of the locomotives owned by American railroads, 4.2 per cent of their passenger cars and 0.2 of 1 per cent of their freight equipment. The statement prepared by Lieutenant Colonel Baker has been distributed to the railroads of the country by the special committee on national defense of the American Railway Association.

According to a statement issued by the department of commerce, 83,652,907 pounds of bleached cotton fiber were consumed during the first three months of 1917 in the manufacture of gun cotton and explosives of all kinds. This quantity is equivalent to 167,306 bales of 500 pounds each. Allowing for a loss in preparing the cotton from the bale to the purified material in nitration, the gross weight of unbleached cotton fiber used for explosives was 257,394 bales.

In a communication addressed to President Wilson, Samuel H. Barker, of the North American, Philadelphia, proposes that the federal government acquire and manage the freight cars of the country in order to solve the transportation problem. Mr. Barker suggests that congress authorize acquisition of the cars at a cost of about $2,500,000,000. Mr. Barker claims that with the freight cars under federal control the country would secure far greater service out of each car, would prevent cars from being used for storage purposes and would enable general standardization.

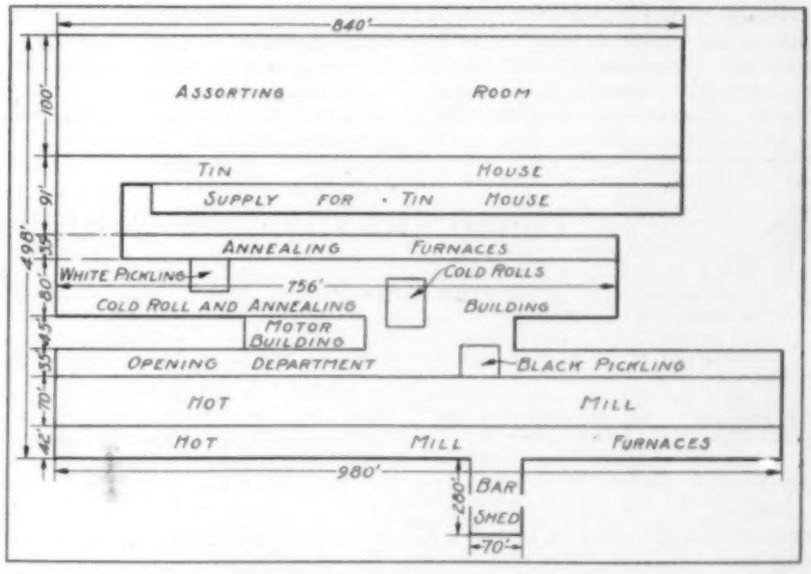


FIG. 3—SKETCH PLAN SHOWING GENERAL ARRANGEMENT OF DEPARTMENTS AT SPARROWS POINT TIN PLATE PLANT

The Scientific Cutting of Metals

The Function of a Machine Tool Often is Restricted by the Use of an Improperly Designed Tool—Poor Lubricants Are Responsible for Many Unsatisfactory Results

BY A. L. DeLEEUW

THE rapidity of progress of the various branches of engineering may be said to be in proportion to the ease with which their principles can be reduced to mathematics. This was never so clearly shown as in the case of the development of alternating-current apparatus. Alternating-current apparatus has known no period of experimentation. Compare this with the slow, hesitating development of the steam engine in its first stages. In that case nothing was known except that steam would exert pressure. No knowledge existed of the properties of steam, of thermodynamics, nor of the mathematics of engineering materials. The moment that the fundamental facts of thermodynamics were understood and were reduced to mathematics, the progress of the steam engine became more rapid.

To Promote Production of Munitions

The need for quick results now that the country is at war, led the National Machine Tool Builders' Association at its recent meeting at Cincinnati to pass a resolution asking the national council of that body to ratify an appropriation for investigating the subject of cutting tools. The resolution was framed as the direct result of a paper which was presented by Mr. DeLeeuw. The accompanying article is a liberal abstract of his paper.

Scientific Development of Tools

What are the things we should know about tools and machine tools to enable us to make these important servants of our present-day civilization follow the line of development which the steam engine has enjoyed? Two stress diagrams of cold-rolled steel are shown in Fig. 1, of which one specimen had a tensile strength of 95,000 pounds and an elongation in 4 inches of 12 per cent, and the other a tensile strength of 85,900 pounds and an elongation in 4 inches of 7.4 per cent. The area of both pieces was ½-square inch and the length between gripping jaws 2 inches. The amount of work done in separating the first piece was 3,500 foot-pounds per square inch of section, and for the second piece 2,000 foot-pounds per square inch. In parting the pieces, the same result was obtained as if half the piece were removed by means of a cutting tool. Of course, this way of removing metal does not permit of controlling the shape or the finish of the remaining piece; but a certain amount of metal has been removed as effectively as if it had been done with a cutting tool. If this amount of metal had been removed by a cutting tool used in one of the present-day machine tools, the amount of power required to do this work would have depended on the quality of the tool and the nature of the machine; but in no case would it have been less than ½-horsepower, assuming a reasonable time element.

If the only function of a machine tool were the removal of metal, we would find that our best machine tool has an efficiency of from 0.12 to 0.22. Even the better of these figures is very low, compared with the efficiency of other machines. If chips could be removed from a piece of work by a straight pull, the ideal machine tool would be one which would remove material with the same amount of power expenditure as that required by the testing machine. While we would not expect to obtain such efficiency in practice, we would certainly aim to reach a much higher efficiency than we are able to obtain now.

Cutting Tool Facts and Theories

So far as is known, no experiments have been made which establish the true nature of the cutting of metals with a reasonable certainty. In *The Art of Cutting Metals* and elsewhere diagrams are shown of the supposed action of a cutting tool. These are shown in Fig. 2. The writer believes that these diagrams represent a very good first guess; but he wishes to point out that this guess is not based on anything better than the inward vision of the authors of these various works. If this guess is correct, then the act of cutting metal is a removal of the chip by tension, and the amount of power consumed for cutting should not be more than that required by the testing machine. If this is so, the total wastage of power in all the machine shops of the world is enormous; and it certainly would be worth while to investigate this matter thor-

Timely Questions on Cutting Problems

When we turn up a narrow disk by means of a square-nosed turning tool, of which the width is greater than the width of the disk, is the action of removing the chip purely a matter of tension?

Does the front end of the tool have any function at all?

How far from the edge of the tool is the point where the chip strikes the tool?

If the action is purely a matter of pull, and the chip does not strike the top of the tool at the cutting point, but some distance farther back, then is it necessary that the cutting edge of the tool be sharp?

What is the nature of the lamination of the chip?

How much power is required for the actual removal of the chip, for the friction between chip and tool, and how much for laminating the chip?

What would be the best shape for such a turning tool for this particular turning operation?

How does the amount of power vary with the various angles of the tool?

If the turning operation is not as simple as assumed in the first question; if, for instance, there is a side feed, such as in ordinary shaft-turning operations, how is the cutting action modified by this side feed?

If the chip is removed by the action of the top of the tool, that is, if the front of the tool has no function, then what determines the nature of the finish of a cut?

In what relation does the power required for the side feed stand to the power required for the actual removal of the chip?

oughly, merely from the standpoint of the conservation of energy.

Among the questions which should be answered before we can design machine tools in a thoroughly scien-

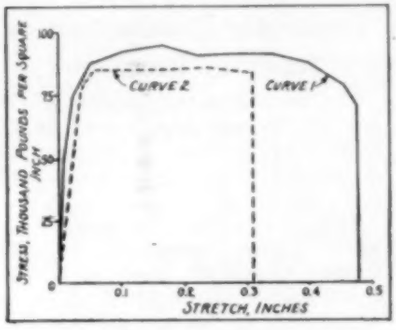
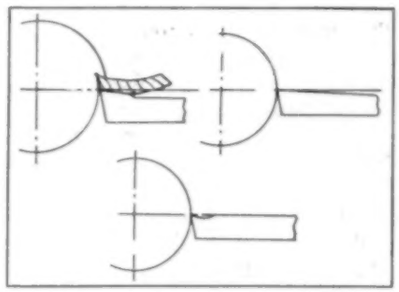


FIG. 1—STRESS DIAGRAMS OF COLD ROLLED STEEL

tific manner are set forth on page 1178.

As dark a subject as the action of the tool itself is the action of a cutting lubricant. It is a well-known fact that the use of a lubricant and the nature of the lubricant used affect both the finish and the size. A very pertinent question which might be asked, is this: If the chip is laminated by tension, that is, if the point where the chip begins to separate from the work is some distance ahead of the point of the cutting tool, how can the cutting lubricant affect either size or nature of finish?

The writer had occasion to look into this matter when trying to determine the best cutting lubricant for automatic screw machines on small and medium-sized work. The lubricant in use was a mineral oil with 15 per cent lard oil. A certain job was selected, for which a form tool was used, and 24 screws were made with the regular compound. The screws came true to size within the limit of one-half of one thousandth. The oil was then removed from the machine



FIGS. 2, 3, 4—CUTTING WITH LATHE TOOLS

and machine and tools were cleaned. The cutting compound to be investigated was substituted and another 24 screws were made. These screws were all larger than those cut with the regular oil. Furthermore, they varied from two and one-half to five thousandths over size. The machine was once more cleaned, and the original oil put back. The screws again came uniform and to size, showing that the cutting of the first 24 screws had not dulled the tool or caused any other disturbing element to enter into the equation. The fact that the cutting compound caused the screws to be over size might possibly be explained by a difference in heating or cooling effect of the different lubricants; but how can the difference in size of screws made with the same lubricant be explained, when there was no such difference with the use of the oil?

To be of value, the results of serious experimentation should lie in the direction of saving of power, diminished wastage of tools, and less strain on the machine, or in the direction of increased output, with or without the other advantages. That such advantages may be reached seems clear and the author wishes to outline some isolated experiments, which, though

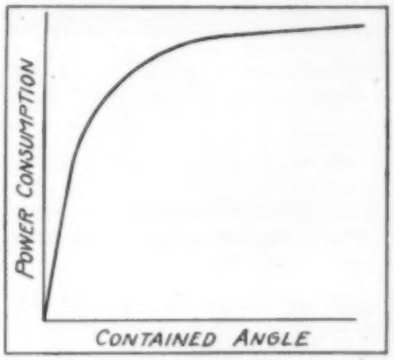
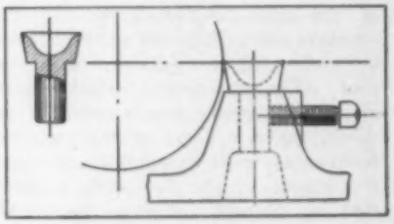


FIG. 5 — PROBABLE RELATION BETWEEN CONTAINED ANGLE OF CUTTING TOOL AND POWER

not complete in themselves, point to very interesting possibilities.

Forged spindles of sixty-point carbon steel were roughed by a tool shown in Fig. 3. As a rule, the tool was able to rough three spindles before a breakdown. In its broken-down condition the tool appeared as shown in Fig. 4. A hollow had been ground out by the chip, but a band of a little more than 1/64-inch in width had been left at the front end, showing that the extreme front of the tool had not been in action. The experiment consisted of carefully measuring the broken-down tools and making new tools of just that shape; in other words, a tool like the old tool, but with a hollow ground in the top of the same shape, size, and location as in the old tool. This tool is shown in diagram in Fig. 4. The hollow was carefully polished, and a tool thus prepared would rough from 9 to 13 spindles. Examination showed that the hollow in the tool would remain smooth almost to the last, and that a complete breakdown followed very soon after the surface of the hollow began to show scratches. No tests of power consumption were made, but it may be expected that



FIGS. 6, 7 — AUTHORS' SMALL-ANGLE TOOL AND TOOL HOLDER

the power required with the old tool was more than with the new tool, as the chip did not have to bend so sharply and as the work required for hollowing out the tool was omitted. Another interesting point about this tool was that the actual contained angle between the front of the tool and the front of the hollow was much less than we would have dared to make between the front and top of an ordinary lathe tool, especially if this lathe tool were to be used for roughing. Nevertheless, under the conditions given, this tool, with the small front angle, stood up better than the original tool with the large angle.

In *The Art of Cutting Metals*, Mr. Taylor stated that his experiments showed no perceptible difference in power consumption for various contained angles of the cutting tool. The writer thought that this conclusion would probably be correct only for the range of cutting angles tried by Mr. Taylor. He imagined that the relation between contained angle and power consumption would probably be a curve of the nature of Fig. 5, and that all the experiments made by Mr. Taylor were within the horizontal part of the curve. Experiments with angles much below the an-

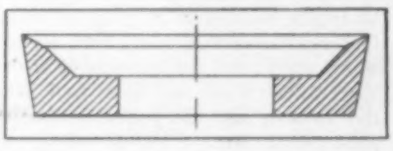


FIG. 8—EXPERIMENTAL ROTARY LATHE TOOL

gles mentioned in *The Art of Cutting Metals* were made. Realizing that an ordinary lathe tool would not stand up with much smaller angles than those used in present-day practice, the tool shown in Fig. 6 was designed. This tool is a body of revolution, and was held in a rigid block of metal, and directly over the lathe

carriage. Fig. 7 shows the arrangement of tool and tool holder used. The tool was used for turning, preparatory to grinding, milling machine overarms, about 4½ inches in diameter and 5 feet long. When the tool gave out, it was turned in the tool holder so as to present a new piece of the edge to the work. In this manner, from 12 to 16 settings could be made with one sharpening of the tool. The sharpening itself was a matter of circular grinding. The tool would make a very smooth cut, and without a steady rest would turn half the length of the bar with a variation in diameter of less than 0.003-inch. The surface of the work was unusually smooth, and the amount required for grinding was much less than usual. Unfortunately, the lathe on which this work was done was too large and heavy to make accurate power readings for so slight an amount of power consumed, the cut being only 3/16-inch reduction in diameter and with a feed of 1/16-inch to 3/32-inch. The action of the tool was peculiar, and did not give one the impression that metal was being cut. This matter of the relation of the contained angle to the power consumption for a given cut had previously led to the introduction of the helical cutter, where the actual angle of the tool is not small, but where the tool is presented to the work in such a manner as to have the effect of a small angle.

Another experiment, more or less related to the same question, was an attempt to use a rotary lathe tool, such as shown in Fig. 8. The edge of this tool would bear up against the work, Fig. 9, so as to have a very slight difference in speed between the work and the tool, and it was further set in such a way as to make the virtual cutting angle very small. The result was that it became possible to use very high cutting speeds without any apparent effect on the tool. The cutting speed was limited by the machine only. With a reduction of 3/16-inch in diameter and a feed of 12 to the inch, a cutting speed of 650 feet was used for cast iron as well as for steel. All cutting was done dry. The chips made by this tool were not broken up, and were practically solid steel bars. Furthermore, the chips as they came off the lathe were cold enough to be caught in the hand. It is, therefore, very likely that a test would have shown a remarkably low power consumption.

Though the foregoing experiments are incomplete in themselves, they show that there are great possibilities before us, and, further, that these possibilities lie away from the present-day shop practice.

An instrument should be built, somewhat along the lines of a microtome, in which a soft material is to be cut by a razor-like blade or tool. This tool should be arranged so that it can present various angles to the work, and tools of various contained angles should be examined. The angles presented to the work should vary as to angle of clearance, angle of rake, and angle of shear. A dynamometer, which should be part of the instrument, should register the pull required for the cut. The material to be cut should be standardized, and it is suggested that paraffine may fill all requirements; by selecting a paraffine of standard melting point, we would also get a material of standard hardness. In this manner the relation between cutting angles and power required could be established over a very wide part of the curve. Though the actual figures obtained would not be immediately applicable to metal cutting, it would make it possible to find the controlling law, and this done, it would then be possible to investigate the cutting of harder

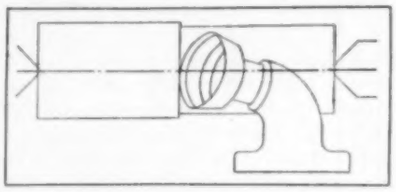


FIG. 9—ROTARY TOOL MACHINING SHOULDER

materials over a small portion of the curve, and compare this portion with the corresponding portion of the curve already obtained. The same instrument could possibly be used for tests on such materials as lead, soft white metal, etc.

Another line of experimentation would be to arrange some machine tool, such, for instance, as a lathe, for running at very low speed, say 1 inch per hour; mount a steel disk on this lathe, and take a cut at the circumference of this disk. In this manner the cutting action would be of the simplest kind, as the tool to be used could be a square-nosed tool of greater width than thickness of the disk, so that there would be no side cut. A moving picture taken at a high rate of speed could then be reeled off at a low speed, and it would probably be possible in this way to visualize what actually takes place in cutting metal. It would readily show whether cutting is merely the result of tension, or whether shear plays a role, or whether both are responsible. It would probably show whether the chip leaves the work ahead of the tool point, and whether or not the front end of the tool is in contact with the work. The writer believes that the time has come to try to interest as many engineers as possible in the subject of collecting fundamental data in regard to the cutting of metals.

Domestic Production of Bauxite Increases

The production of bauxite in 1916 was 425,359 long tons, valued at $2,297,825, an increase of 43 per cent in quantity and 52 per cent in value over 1915.

This is a notable increase for the whole United States, but the most striking figures are those for Georgia and Alabama, in which the production of bauxite was increased from 25,008 long tons in 1915 to 46,410 long tons in 1916, a gain of 86 per cent. A large part of this increase is due to the operation of new and old mines in central Georgia, notably in Wilkinson, Meriwether, and Sumter counties.

The production in Arkansas and Tennessee was increased from 272,033 long tons in 1915 to 378,949 long tons in 1916, a gain of 39 per cent. This increase can be attributed to the great development of the well-known deposits in Arkansas.

There has been much activity in Georgia and Alabama, where many newly found deposits were brought nearly to a producing stage in 1916. Advices received by the United States geological survey, department of the interior, indicate that a number of old deposits in these states will be re-opened, owing to the increased value of the ore and to the fact that it is used by many new enterprises.

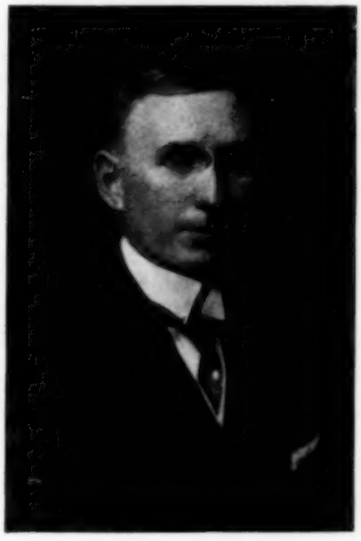
Plans Industrial Safety

At a recent meeting held under the auspices of the American Museum of Safety in New York, plans were drawn for an organization to be known as the National Committee of Industrial Safety, which is to act as an auxiliary to the advisory committee of the National Defense Council. It is to have 15 members who will be selected as a result of experience in fire prevention, structural safety, dust and fume work. The headquarters of the committee will be in the Octagon building, Washington.

The American-Russian Chamber of Commerce, New York, anounces that the 1918 edition of "Industrial America", a handbook of industrial, commercial and financial information with a classified trade directory of American concerns, for use in Russia, is now in the course of preparation.

Prominent Steelmakers Discuss Important Commercial and Technical Subjects

JOHN A. TOPPING, chairman of the board of directors of the Republic Iron & Steel Co., has spent his entire life in the various branches of iron and steel manufacture and today is one of the leading men of the industry. Mr. Topping was the first manufacturer of open hearth steel rails in this country. Thus, his paper on "Co-operation and Mobilization of public Sentiment" represents the mature judgment of a business man whose varied experience entitles him to a careful hearing. He outlines the part business men must play in this country's affairs, during the war



JOHN A. TOPPING
Chairman of the Board of Directors of the Republic Iron & Steel Co.

and in times of peace. This paper is published on page 1187 of this issue of *The Iron Trade Review.*

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MORTALITY in warfare has been reduced a marvelous degree by the untiring efforts of the medical profession. Physicians in industry, although holding a position less spectacular, have ample opportunity to use their skill to prevent disease and to aid the wounded and sick. Dr. William O'Neil Sherman who has had extensive experience as chief surgeon of the Carnegie Steel Co., tells how the progressive, industrial plant physician may profit

DR. WILLIAM O'NEIL SHERMAN
Chief Surgeon of the Carnegie Steel Co., Pittsburgh

by the increased knowledge of the army doctor in "Surgical Discoveries of the War and Their Application to Industrial Accidents."

* * *

STEEL castings have been the basis of many an interesting discussion. That these castings can be made successfully is indicated by

ROBERT P. LAMONT
President of the American Steel Foundries, Chicago

the many heavy motor trucks which jog along over rough pavements on wheels cast of steel. Robert P. Lamont, president of the American Steel Foundries, has made an intimate study of the history of steel castings and of the modern methods used by various founders in this country which is outlined in his valuable paper on "The Manufacture of Steel Castings."

* * *

UNTIL very recent years the nature of reactions in blast furnaces was a closed book to scientists, and even at the present time the exact characteristics of

WALTHER MATHESIUS
Superintendent of Blast Furnaces, Illinois Steel Co., South Chicago

some of the reactions have not been fully determined. However, the furnace operator today, thanks to the chemist, is familiar with most of the chemical reactions that take place within the shell. Such knowledge not only permits him to adjust his mixtures properly but it also paves the way for improved operation. "The Chemical Reactions of Iron Smelting", by Walther Mathesius, superintendent of blast furnaces, Illinois Steel Co., reflects a large amount of study and a thorough acquaintance with modern blast furnace practice.

Turbo-Blowers for Blast Furnaces

A Discussion of the Relative Economies of Steam Turbines and Gas Engines for Blowing Blast Furnaces Based on the Performance of a Typical Four-Furnace Plant

BY RICHARD H. RICE AND SANFORD A. MOSS

THE blowing of blast furnaces is a process which, at best, is attended with considerable variation, both in the operation of the furnace, and in the factors which are necessary to the proper working of the plant as a whole. In modern furnace practice every effort is being made to reduce the number of variables and increase the steadiness of operation, and a careful study of these variables and what is being done to decrease or eliminate them will be useful. The variable elements which enter into the operation of a blast furnace are as follows:

1.—Variations in the composition of the ore, and variations in the size of the particles thereof.
2.—Variations in the composition and in the size of the particles of the limestone.
3. — Variations in the carbon content, strength, and size of the coke.
4.—Variations in the quantity of oxygen blown into the furnace, due to variations in barometer, temperature, and humidity of the entering air.
5.—Variations in the pressure and volume of the blast, due to the character of the blowing agent.

Of these variables, those which have no relation to the blast are being dealt with as follows:

1.—Variations in the composition of the ore are being dealt with by proper combinations of ore; and variations in the size of the ore are being dealt with by proper means of sizing the ore, including crushing, screening, sintering and roasting.
2.—Analyzing and mixing various compositions of limestone in order to secure a uniform quality.
3.—Careful choice of coke, and proper attention to the uniformity of manufacture.
4.—An attempt to decrease the variables in blowing was made by the introduction of the dry blast. The expense of the plant for this method of removing the moisture from air and the operating cost thereof is so great that this method of treating the blast has not made any considerable progress recently.
5.—The introduction of the turbo-blower has provided a means of rendering the blast conditions more uniform. Not only is the blast pressure held steady but also the very steadiness of the blowing permits accurate measurement of the air volumes, and accurate adjustments thereof, and compensation for variations in barometer, thermometer and humidity; so as to insure a constant rate of flow of oxygen into the furnace, and the accurate adjustment of this rate to the needs of the furnace conditions.

It is difficult to demonstrate, to those furnace operators who have not had experience with the steadiness and ready controllability of the blast from a centrifugal compressor, what the effect of this steadiness of conditions will have on the furnace; which is in direct contrast to the attitude of those who have had experience with the operation of such units. In no case has there been a failure on the part of people who have acquired experience with this method of blowing, to appreciate the improvements which result from these conditions. It is only recently, however, that an accurate means has been provided for correcting the rate of blowing to correspond with the variations in atmospheric conditions. Experience with the use of these corrections is very limited; only one case is known to the writer where some of these corrections have been applied by observation of the atmospheric conditions and an arbitrary correction of the weight beam in accordance with this observation, and in this case (I am speaking of the Northern Iron Co., Port Henry, N. Y.) the correction has only been made for barometer and temperature, and no attempt has been made to correct for humidity. It is not to be wondered at that those whose experience is exclusively with ordinary methods of blowing should fail to appreciate the desirability of the steady blast and the accurate measurement of oxygen, for the reason that there are so many variables which necessarily have occupied the attention of our blast furnace operators that it has been almost impossible to differentiate and evaluate the various variables which have to be dealt with. By the recent improvements in the operation of furnaces, which permit the removing of some of the variables by sizing of the ore, and by proper attention to the coke and limestone charges, some of these variables are being removed and the final step would seem to be the removal of all possible variations from the blast itself.

It goes without saying that the blast from a centrifugal compressor will be a steady flow without pulsations. The very nature of the apparatus necessitates this. It also seems evident, and has been proved by actual observation of the blast delivered from a reciprocating machine discharging its air in puffs, each puff corresponding to one stroke of the engine, that the flow of the blast must be more variable and produce some variations of effect in the furnace. Whatever these variations are, it seems evident that it is desirable to remove them. Experience with centrifugal machines on blast furnaces demonstrates this, and shows that an improved output, a somewhat less quantity of dust, and a general steadying up of conditions has resulted. A part of this improvement is due to the steadiness of the blast, and a part is due to the more accurate control of the rate of blowing.

An interesting experience which shows the importance, and even absolute necessity, of accurate control of the rate of air flow has been had with a blast furnace centrifugal compressor within the last few years. In this case the measuring device which was relied upon to determine the rate at which the blast was being blown was so located that the

A Note by the Editor

The accompanying article discusses the turbo-blower for blast furnace use from the standpoint of the engineer who has been intimately associated with the development of this type of apparatus. There have been unusual improvements in the design of apparatus of this character during the past few years, and for this reason the discussion by Messrs. Rice and Moss possesses features of exceptional interest. The authors are connected with the General Electric Co. R. H. Rice is engineer and Sanford A. Moss, engineer, turbine research department, Lynn, Mass. The original paper was read before a meeting of the Engineers' Society of Western Pennsylvania, Pittsburgh.

In order to present all sides of this important subject, this article will be followed next week by a discussion from the standpoint of an engineer familiar with the development of the large gas engine. This discussion, which was also read before the Engineers' Society of Western Pennsylvania, will be presented by Frederic Ottesen, chief engineer, gas engine department, Mesta Machine Co., Pittsburgh.

The authors of this paper, which was read before the Engineers' Society of Western Pennsylvania, Pittsburgh, are connected with the Lynn, Mass., plant of the General Electric Co. R. H. Rice is general engineer and Sanford A. Moss, engineer, turbine research department.

indications of this measuring device were inaccurate; at some times indicating more blast than was actually flowing and at other times less. The result of this inaccurate measurement of air was an inaccurate adjustment of the machine, causing excessive quantities of dust to be produced and a decreased output from the furnace, as compared with the reciprocating engines, which were installed to blow the same furnace in alteration. After operation in this condition for a considerable period the measuring device was relocated where the connections were more accurate. I am informed that the result of this relocation and consequent more accurate operation of the blower, was to decrease the quantity of dust to normal and increase the output of the furnace. In order to determine the effect of improvement in these parts such instances are of extreme value. They show the importance of the proper regulation of the rate of flow of blast and indicate the possibilities which can be expected when inequalities and irregularities are entirely removed.

Governor Controls Rate of Flow

A governor has been devised that is capable of accurately controlling the rate of blowing. This governor is used on blast furnace blowers built by the General Electric Co. It consists of a disc riding on the ingoing air in the center of a frustro-conical portion of the inlet pipe. Movements of the disc are transmitted direct to the valve gear, and ample power is secured by the use of very moderate dimensions. The angularity of the walls of the conical pipe is determined by the desired accuracy of regulation. No packing is necessary and the device is therefore practically frictionless and wearproof. Differing rates of flow are secured by moving a weight along a scale beam, which is graduated in cubic feet of free air per minute, and calibrated at the factory before shipment.

A recent improvement of this governor consists of a means of adjusting the index on the sliding weight to compensate so that the weight can readily be reset to take account of variations in atmospheric conditions. The following is a description of this device, which is called a volume corrector.

On the scale beam lines are marked with various numbers of cubic feet per minute. An index marked on the sliding weight is set opposite the number of cubic feet per minute which is desired should be held by the constant volume governor. This index is adjustable and its exact position is secured by the setting of three scales which are carried on the sliding weight. These scales are for barometer, atmospheric temperature, and atmospheric humidity. Proper settings on these three scales are made corresponding to atmospheric conditions, and this automatically sets the index on the sliding weight in such a position that the corresponding volume on the scale beam is corrected for the atmospheric conditions as set.

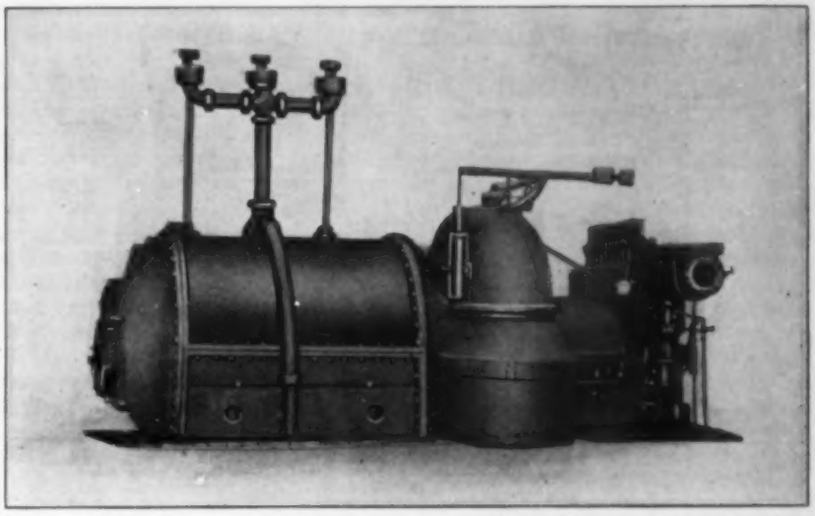


FIG. 1—TURBO-BLOWER WITH CONSTANT-VOLUME GOVERNOR

A phenomenon with which we had to deal in the early days of our experience with centrifugal compressors on blast furnaces was the so-called "surging" which appeared when the machines were operated at considerably less rates of blowing than those for which they were designed, or when excessive pressures were met with, as in case of tightening up of the furnace. The occasional phenomenon which is often called "surging" is only met with when, at normal pressures, the volume being blown through the centrifugal compressor is considerably less than that for which it was designed. In case of high pressures, for instance with a tight furnace, this phenomenon may be met with, although the volume discharged is about that for which the machine was designed. It consists of an alternate forward and back flow of air through the compressor, and is the result of the improper functioning of the discharge vanes owing to the variation of blowing conditions from those for which the vanes were designed. These alternate forward and back flows through the compressor result in a variation of pressure in the discharge mains of sometimes as great as two pounds, and cause some irregularity in the working of the furnace. This phe-

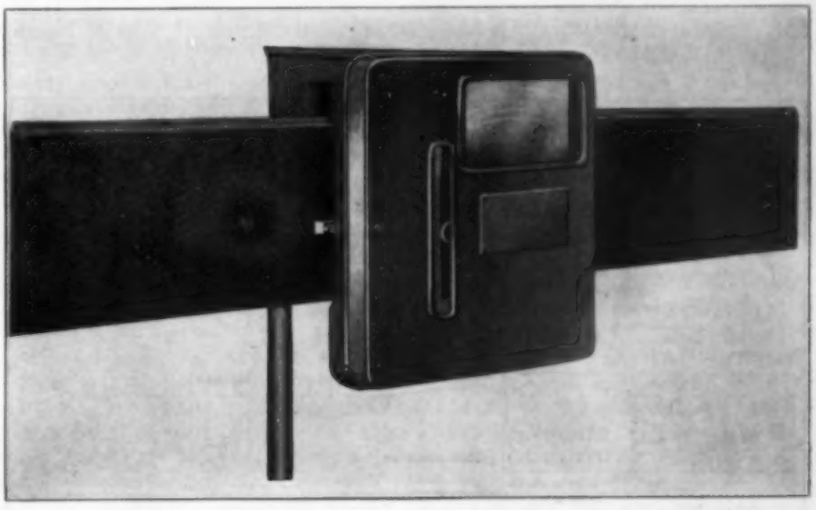


FIG. 2—VOLUME CORRECTOR FOR TAKING ACCOUNT OF ATMOSPHERIC CONDITIONS WITH A TURBO-BLOWER EQUIPPED WITH A CONSTANT-VOLUME GOVERNOR

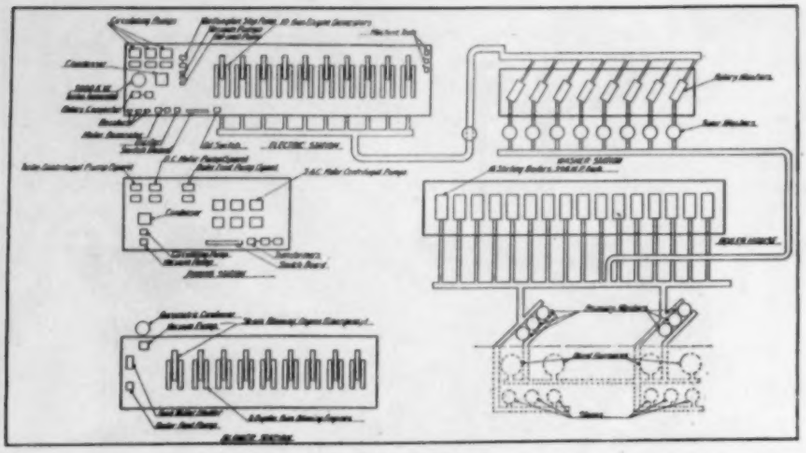


FIG. 3—LAYOUT OF FOUR-FURNACE GAS ENGINE PLANT

nomenon is not peculiar to any one type of centrifugal compressor, but is met with in all types. For some time after the installation of our first machines this phenomenon was difficult to deal with, particularly as the first machines were designed for much larger quantities than have ever been blown through them. However, in the 10 years of experience which we have had with this apparatus effective means have been devised and applied which render it unnecessary that any such phenomenon should again give difficulty.

The steps which have been taken to eliminate this surging are: First, the reasonable proportioning of the machine to the requirements of the furnace; second, provision of a by-pass with an automatic valve which, under conditions which would ordinarily permit surging, leads back into the inlet a small quantity of air. This valve is self-compensating for variations in volume and pressure, and once adjusted needs no attention. The use of this apparatus increases the efficiency of operation in conditions where it is operative, since it maintains the proper air discharge pressure without diminution.

The centrifugal compressor, therefore, properly governed, affords a means of blowing the blast furnace with the steadiest possible conditions of blast and the most uniform rate of inflow of oxygen contents; a means of blowing which can be adjusted to meet any variations which may be necessary in the composition and mechanical conditions of the charge; one which is automatic in operation when set for any existing condition and quickly reset for any change of condition of furnace or atmosphere and one which requires comparatively little care and attention on the part of the operating staff.

Another feature, which tends to uniform operations, and permits of more accurate determination of the blowing conditions, is the fact that the turbo-blower is readily manufactured in such sizes that a single blower can be used for blowing a single furnace. In this way each blowing unit is adjustable to meet the exact furnace conditions with certainty, thereby increasing the uniformity of the product and the amount thereof; also decreasing the gas consumption, since the turbo-blower is more efficient in the larger sizes than in the smaller, and also because two units, whether of turbines or of engines, are less efficient than a single unit. This is on account of the fixed losses which exist in every turbine or engine unit and which do not increase in proportion to the size of the unit.

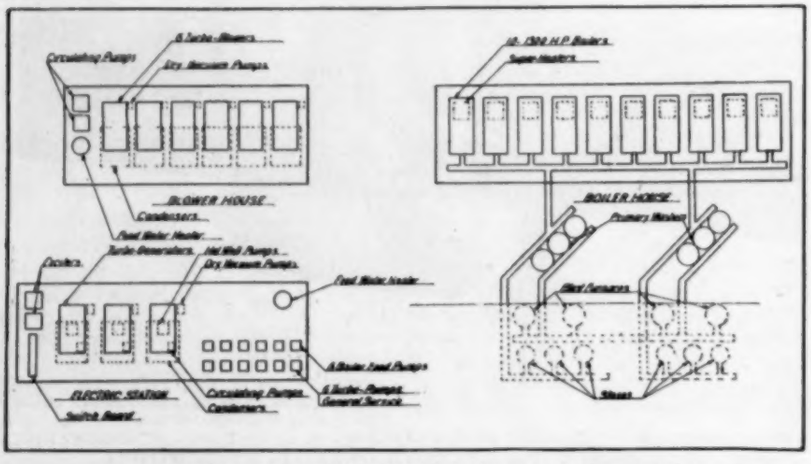


FIG. 4—LAYOUT OF FOUR-FURNACE STEAM TURBINE PLANT

Improvements Have Been Effected

The efficiency of the turbine need hardly be argued here. It is the cause of its adoption as a prime mover in all our central power stations, and in practically all our industrial plants throughout the country in competition with all other forms of units. Very recent improvements in turbine construction have greatly improved the efficiency of such units, and these units of increased efficiency are now available in cases where steam consumption is an important requirement of blast furnace blowers. The discussion which will follow as to the cost of blowing furnaces will be based upon the use of one of these modern units. Another feature of this type of blowing apparatus is that, considering its efficiency, its first cost and cost of installation, its operating costs are also low.

Reliable figures have been obtained from existing plant as to the actual cost of operation, both for the gas plant and the steam plant. While these figures were not obtained from plants of the same magnitude, or located in exactly the same places, the conditions are so nearly uniform as to location, and figures for gas engines are obtained from plants which are so much larger than the turbine plants compared with them, that it is felt that the comparison is not unjust; in fact, any advantage which would obtain from the character of the plant appears to be in favor of the gas engine. It is well known that large plants operate with greater economy than smaller ones.

The gas engine figures are not those obtained from any one location, but are the result of comparison of figures of plants in several locations. In every case where choice of data could be made those results most favorable to the gas engine have been chosen.

In selecting the gas engine installations best adapted for comparison with the steam turbine plant, the best possible examples of recent gas engine practice have been chosen; plants which are in the hands of most capable operators, installed for the purpose of securing the highest efficiency and containing all the various ele-

ments for proper operation for such plants. Furthermore, by reason of the care and supervision which is exercised over these plants it is believed that they are, without unnecessary expenditures, now in the best possible condition for service, and maintained at the highest practical efficiency. Furthermore, the physical location of these plants is also favorable, since they are placed at such points as give them readily proper supplies of ore, fuel, limestone, water and all the other materials necessary for economical operation, and they are equipped with handling devices for storing and transportation of these materials to the fullest practical extent. They are large plants, involving more than four blast furnaces, but in order to bring the plant unit down to one which would be most practical for consideration in new installations they have been reduced to the equivalent of a four furnace plant.

Increased Economies Due to Size of Plant

In making this reduction no allowance has been made for a decrease of operating efficiency which would result in the reduction in size. On the other hand, the turbo-blower plant which has been selected for comparison is one which is used with only two furnaces. In enlarging it to the four-furnace plant no account has been taken of the increase economics which would result from the increase in size. Therefore it will be seen that the turbo-blower suffers in two directions; first, that the gas engine plants selected for comparison are larger than the plant which is taken as the standard unit, and second, the turbine plant which is selected for comparison is, in turn, smaller. If these facts were taken into account we should expect that the figures would come out more favorable to the turbine than results actually given; but it is not desired, in making this comparison, to leave any doubt as to the conservatism of the result.

In considering the installation of a gas engine equipment for a steel mill of the type under consideration, the first fact which strikes the investigator is the first cost of the installation. It has not been customary in the past to consider the addition to operating cost which results from the charges necessitated by this capital investment. It is, however, of vital importance in considering the desirability of installation of one type of prime mover or another, that all the elements involved be taken into account in the same way that they are taken into account in other cases involving differences of first cost. It is obvious that the capital invested in such plants must give some return to the investor, and a proper allowance for this return is a just and legitimate charge against operating expense. Furthermore, these investments involve taxes, which also should go against operating expense; and insurance is an item of the same class. Furthermore, and more important than any of these, is the question of obsolescence, by which is meant the amount to be laid by as a sinking fund to retire or amortize the plant at the time when its usefulness becomes extinguished by the improvements in the available apparatus, not so rapid or so easily seen as in the case of the horse, the two instances are fairly analogous.

If these fixed charges on the investment are not taken care of by charges against operating expense, they must be handled in some other manner, by charges against the product produced by the mills, or otherwise; which charges are wrongly allocated and do not show, unless put into operating expenses, the true value of investment in the various types of apparatus.

In most steel plants it has been the custom to consider merely the running charges. The management has been given the plants to operate, and it has been judged by this cost of operation without including the whether as to efficiency, as to increased reliability, or in other ways; also to provide for the general ageing of the apparatus which takes place no matter how carefully the repairs and renewal of parts is taken care of. That is to say, this obsolescence charge which I am now discussing also includes depreciation.

It is, perhaps, not necessary to go too deeply into the necessity of an obsolescence or depreciation charge, but a familiar instance which is often cited, to show the necessity of the charge, is the case of the horse, investment in which is automatically extinguished by the ageing of the horse no matter how carefully he is taken care of, kept free from sickness, and otherwise preserved so far as possible in good condition. While the depreciation of machinery is often fixed charges due to investment. This had led to an inaccurate view of the desirability of extreme efficiency in the prime mover and does not consider the cost of obtaining this high efficiency. This leads to a use of the most expensive plant, provided such plant gives a larger output from the gas available without regard to the first cost.

Up to within a short time there has been a considerable difference in the efficiency of utilization of blast furnace gas as between the steam engine and the gas engine, but the latest types of steam turbines permit a steam plant to be operated with the same output of electric power to the mill, while also furnishing sufficient gas for blowing purposes, as plants containing gas engines, by the use of a very reasonable amount

Comparative Costs for Typical Four-Furnace Plants

FIRST COSTS

	Gas engine	Steam turbine
Primary washers	$131,250	$131,250
Secondary washing station	300,000	.....
Gas pipe from boiler house	212,500	.....
Boiler and piping	167,500	609,200
Boiler house	41,250	123,750
Electric station apparatus	3,250,000	745,600
Electric station house	250,000	69,200
Blowers, etc.	1,812,500	726,416
Blowing station house	237,500	69,200
Pumping station, standpipe, conduits	787,500	293,484
	$7,190,000	$2,768,100

CHARGES—DOLLARS PER YEAR

Running charges:	Gas engine	Steam turbine
Primary gas washers	$2,100	$2,100
Secondary gas washers	42,000	.....
Boilers	12,000	32,750
Electric station	90,000	68,250
Blowing station	49,500	42,000
Pumping station	6,000	4,000
Running charges, total	$201,600	$169,100
Fixed charges at 13 per cent	934,500	359,800
Coal	21,652	78,352
Total charges	$1,157,752	$607,252

of make-up coal, as will be seen later (Table, page 1185, under Charges, Dollars per year). Therefore, the cost of fuel is one of the smaller considerations in judging the relative merits of these two types of installation; whether the price of coal is high or low, the comparison rests on other grounds. Even with less efficient turbines the cost of coal for make-up is only one of the items which enter into the complete cost of operation, and we can make up a proper comparison of gas engine and steam turbine plants by adding both the fixed charges and the running charges in each case, and adding the excess cost of coal in the turbine plant, if any; and that plant which gives the least total with these figures is the better, regardless of its thermal efficiency.

All Elements Included

The following analysis includes every element of the operating cost of such plants in detail. Blast furnace and steel mill plants have established certain arbitrary subdivisions for convenience in cost accounting; blast furnace cost, gas purifying cost, gas power station costs, etc., being kept as independent groups and charges being made from one department to another. These sub-divisions are not used in this paper.

The gas from the furnaces is used for the following purposes: Blowing the furnaces, pumping the necessary water for use about the blast furnace and in steel mills, and generating electricity for driving the steel mill and all auxiliary apparatus about the blast furnace plant.

On this basis complete plants have been laid out for a steel mill as an adjunct to four blast furnaces, one of these plants operated by gas engines and the other by steam turbines. These have been called "Typical Gas Plant" and "Typical Steam Plant", respectively. These plants include a blast furnace blowing station, an electric generating station and a pumping station. The figures used for operation, including the amount of carbon burned in the furnaces, gas supplied, electric power produced, water pumped, etc., are all representative of actual blast furnace and mill conditions. The costs have been carefully collected and adjusted to represent prices ruling in November, 1916.

In the four-furnace gas engine plant there is included a gas-electric and gas blowing station with the necessary steam spares for emergencies. It also includes a boiler house supplying steam for various purposes and fired by gas when it is sufficient, and by coal when it is not. There are also proper gas washing and pumping stations.

The plant will be of proper size to supply all the blast furnace demands of air, water, steam and electricity. In addition it will supply during week day working hours, 5,000 kilowatts per furnace, and 4,450 gallons of water per minute per furnace for steel mills. During the time when gas is insufficient to enable the full output of the steel mills to be produced, coal will be used for make-up, the cost of which is included in the figures.

The carbon burned or gasified in the furnace is taken at 12,835 short tons per furnace per month. This corresponds to 400 tons of pig per day, with a coke rate of 2,100 pounds per long ton, or 500 tons per day with a coke rate of 1,700 pounds per long ton.

Two Cases to Consider

In determining the availability of turbo-blowers for blowing furnaces, two cases arise in practice. The first case is where the furnace is not connected with any steel mill and is not located in a place where surplus gas is of any value. In this case the highest efficiency is not necessary because, in general, the turbo-blower is so economical that the supply of gas to the furnace is greater than is necessary to generate steam for blowing and for the other plant purposes, and therefore large quantities of gas go to waste. When, however, a steel mill is located adjacent to the blast furnace and the surplus gas can be used for generating electric power for operating the mills, the question of gas consumption becomes of vital importance, and is one of the elements which is to be considered in determining the availability of the apparatus for the purpose. For this reason a considerable amount of data has been gathered, for the purpose of making a study as to the relative operating costs of the apparatus now in use, and which can be obtained, for use in steel mills where blast furnaces are included in the equipment.

Typical Four-Furnace Turbine Plant

The four-furnace steam turbine plant contains boilers and turbo-generators of sufficient capacity to make the output to steel mills of water and electric power equal to that of the typical four-furnace gas plant previously given. The power house will contain six turbo-blowers and three 12,000-kilowatt turbo-generators with the necessary auxiliaries including pumps for supplying all of the water used about the plant, boiler feed pumps, feed water heaters, etc.

The steam conditions will be such as are used in modern electric stations, 235 pounds per square inch gage, 200 degrees superheat and 28.5 inch vacuum. It turns out that no coal is needed on the average, but to equalize poor gas supply, and excess power demands, an amount is used to bring the operation on a par with that of the gas engine plant.

It is to be noted, however, that even with 150 pounds and 28 inches vacuum, a steam plant would make a good showing, of course including the cost of the coal, which would then be greater.

Cost Comparisons

Comparisons have been made by others between gas engine and turbine plants using estimated figures for the most part. Such figures started out with an assumed amount of blast furnace gas produced per ton of iron and with a full load test figure for gas engine efficiencies; and practically 100 per cent volumetric efficiency of reciprocating blowing tubs. All such suppositions are avoided in the present comparison. All of the data is secured from plants in actual operation, and this information is used in such a way as to avoid assumptions of fundamental values.

Taxes, interest and obsolescence or amortization are included under the head of fixed charges. (Depreciation is supposed to be divided between repairs, maintenance and obsolescence.) Fixed charges are taken throughout at 13 per cent. This is a customary figure for gas engine plants. Steam turbine electric stations often use a lower figure in the neighborhood of 11 per cent; therefore, the use of a figure 13 per cent throughout is relatively favorable to the gas engine case. The fixed charges include the following items:

	Per cent.
Interest (on bonds or capital invested)	5
Taxes	1
Insurance	1
Obsolescence (amount laid by as a sinking fund to retire or amortize the plant)	6
	13

The running charges include operating charges and also charges for maintenance and repairs, so as to keep the plant in first class condition up to the time it is fully amortized. Total charges are found by adding fixed charges, running charges and cost of coal. Make-up coal is used under emergency conditions and the cost of it is included in the total charges mentioned. Coal is taken at $2 per long ton delivered at the fireroom door, with 13,500 British thermal units per pound.

The running charges of the turbo-blowing apparatus are taken from the

(*Continued on page* 1191)

How to Mobilize Public Sentiment

During the War Business Men Must Prepare for Peace—The Part They Can Play in Molding Public Opinion—Wartime Co-operation Should Be Continued When Peace Comes

BY JOHN A. TOPPING

THE president of the United States in his appeal to awaken the nation to its responsibilities urged that "we all speak, act and serve together" in response to our country's call. The President's appeal met a quick response from business, as evidenced by the mobilization of our financial, industrial, transportation, telephone and telegraph facilities, but our young men made a disappointing response to his urgent call for volunteers for army and navy service.

The lack of patriotic enthusiasm suggested by this experience is, I think, undoubtedly due to a lack of understanding by many of our people of the responsibilities of citizenship and of our national ideals. We cannot have unity of purpose, however, without a more thorough conception of individual responsibility; and to awaken this spirit of moral consciousness we must have a broader education of the people. In other words, if democracy as a governing force is to be effective, it can only be made so by qualifying the people through education, or by necessity, for their civic responsibilities. In no other way can legislative initiative be taken from the political demagogue. It required the stimulus and necessity of war to break down the traditions of the volunteer system. We are to be congratulated on this result, for we have obtained in exchange equal service, or selective draft, which means that the first gun has been fired for the principle of co-operation. And I believe the public mind is now in a receptive mood to apply this principle more broadly, not only through the reconstruction period after the war, as is proposed by the Lever bill for the regulation of commodity prices, but for an indefinite period thereafter, if we inaugurate an earnest educational campaign for general co-operation.

Necessity has suggested many of our inventions, but necessity may also become, as in this case, a great educational influence. It must be admitted, however, that the necessities of war are decidedly more urgent than the necessities of peace. And therefore if public sentiment is to be mobilized and educated to a point of demanding co-operation, or other methods for the protection of business after the war, we must now, like England, prepare for peace while engaged in war. It must not be overlooked that war has brought about revolutionary economic changes, and a world-wide readjustment of values must necessarily follow war inflation, although I do not expect to see the purchasing power of the 1914 dollar restored for some time to come, if ever.

How Congress Can Help

Mr. Topping believes laws covering the following subjects should be enacted:

FIRST: *Amendments to the Sherman anti-trust act to legalize price co-operation, and subject possibly to government regulation, to become effective after the war, so as to prevent disorderly liquidation of commodity values during the reconstruction period, and to stabilize values thereafter for the protection of the general public.*

SECOND: *Revision upward of the tariff where necessary to protect home trade against unfair foreign competition; preferential tariff rates, however, to obtain wherever reciprocal trade agreements can be made to our advantage.*

THIRD: *A thorough overhauling of our marine laws and the enactment of such amendments as will justify and encourage capital to become interested permanently in the operation of overseas shipping. If proper protection cannot be given capital to justify it engaging in overseas shipping and to successfully compete with foreign ships without subsidy, then we should subsidize American shipping.*

Curb the Political Demagogue

The new conditions and new influences now confronting us should be carefully studied. Business men must help solve future problems in a practical way and must not, as heretofore, depend so largely upon academic thought for the solution of practical questions. To impress this view on the public mind, or to accomplish anything, in an educational way, business men must take a more active part in politics, and thereby curb the influence of the political demagogue, who has heretofore initiated most of the reactionary legislation from which business has suffered.

Co-operation, in my opinion, is the key to the solution of most of our national and business problems. In recognition of this view, co-operation as a principle has been adopted by the leading nations of the world. Only recently A. Bonar Law announced in the English house of commons that preferential tariffs as a policy had been agreed to by Great Britain and her colonies, and that hereafter closer reciprocal treaties and co-operative methods would be worked out between them and their allies. England, notwithstanding the burdens of war, has, through co-operative methods, so co-ordinated her working forces that she has substantially maintained her normal overseas trade and has also so effectually mobilized public sentiment favorable to the protection of general business that it is freely predicted she will abandon in the near future her traditional policy of free trade. England has also closely followed Germany in the policy of encouraging capital combinations for trade, even to the extent of assisting such combinations by government loans, where necessary, thus recognizing that it requires big business to develop national resources or to promote and maintain industry successfully. The dyestuff trade is a notable case of this character. While co-operation as practiced by the various governments now engaged in war, may be, as claimed by some writers, a "real working of state socialism", I maintain that it is at least enlightened socialism, for through the application of German and English business methods waste is minimized, efficiency stimulated and productivity increased. I am convinced that we also must adopt, as a national system, co-operation as practiced abroad; also enter into reciprocal tariffs, and, furthermore, we must co-operate wherever possible, not only at home, but also with all foreign countries which are reciprocally inclined, for the promotion of trade or for the protection of our other interests.

No doubt the objection will be raised that the European brand of co-operation is socialistic; but this objection, in my opinion, is sentimental rather than practical, parti-

Presented at the meeting of the American Iron and Steel Institute at New York, May 25. The author, John A. Topping, is chairman, Republic Iron & Steel Co.

cularly if by the application of co-operation we can advance the general welfare of our country. Furthermore, is not evolution by experience preferable to revolution by force; and does not the co-operative experience of the world justify setting aside former convictions born of other conditions?

The Necessary Legislation

The mobilization of public sentiment by educational processes, however, takes time and we should not delay our efforts to "Wake Up America" to the problems of peace and to emphasize the necessity for co-operation. To make this accomplishment practical and possible, constructive legislation of somewhat the character outlined in the accompanying box will be necessary.

The method I would suggest for promoting the necessary preliminary campaign of education for the mobilization of public sentiment favorable to this legislative program would be co-operative publicity, which power is now generally recognized and recently was employed by the Academy of Political Science in calling a national conference of our leading citizens to publicly discuss and publish ways and means of improving our foreign relations, the object being not only to promote our diplomatic relations, but also to extend our commerce. Unfortunately, there are not many business men who are willing to devote their time to public affairs. But does not urgent necessity call for patriotic service in this direction?

I am thoroughly convinced that no executive or business man, particularly those who are directing the affairs of public corporations, will hereafter fully measure up to his executive or public responsibilities unless he gives these questions his most careful thought, and unless he is willing also to devote at least part of his time to public service. Edward N. Hurley, former chairman of the federal trade commission, stated not long since that what business needed was constructive statesmanship.

Introducing Business to Politics

In a recent discussion of this subject that I had with a prominent senator, he admitted that one of the great difficulties confronting the nation is that real politics and real business are not well acquainted; that neither fully understands the principles or the motive power that is driving the other. Relative to this subject, the editor of one of the prominent magazines also said that education must be made to include a more serious study of the relations of law making and business; that business men should co-operate with newspapers in giving publicity to matters of public interest, and thus help educate the politician to business needs. Another editor of a leading trade paper stated that there should be co-operation among trade journals on editorial policy in support of general business propaganda. Even Washington, as has been recently remarked, now recognizes the value of co-operation, and of a "Gary dinner" when it is desirable to mark prices down. There is no doubt, I think, that the educational influences of co-operation for war, considered in connection with the government's approval of the principle of co-operation for the promotion of export trade, will finally result in the approval of this principle for the regulation of general business operations. At least, we have made a start in this direction, for now, as one of the allies, we are fully committed to co-operation for war. And will we not be automatically committed to the general scheme of co-operation after the war as a necessary condition to terms of peace?

Missionary Work at Home

I would therefore urge upon all of you to "speak, act and serve together" in the work of mobilizing public sentiment for co-operation, for the prevention of waste, for the conservation of our natural resources, for the encouragement of thrift, and for the general promotion of the public welfare. Let me also urge upon you to enlist for this service now, begin your campaign at home, educate your local chamber of commerce to our business needs, urge the co-operation of your local press, and also endeavor to educate your employes to the viewpoint that your interest is their interest. Furthermore, we should impress upon our representatives in both the house and senate that their co-operation in this general welfare work will hereafter be considered by their constituency as part of their official obligation. As a preliminary step towards educating the employe of foreign birth in the fundamentals of citizenship, we should also give more active support to the Americanization movement by co-operating with the Y. M. C. A. and our local boards of education. As evidence of the practical character of this co-operative work, the Youngstown, O., Americanization committee reports that 144 foreigners, representing 16 different nationalities, were graduted during May into full citizenship after passing all the educational tests required.

As both "big and little business" are loyally supporting the government in times of war, "big and little businesses" should demand loyal support by the government in times of peace, for only by co-operation can we completely co-ordinate our working forces for the protection and advancement of the nation during either war or peace. The Hon. Chas. E. Hughes sums up our national situation in these words: "We have got the basis for success; what we now need is the motive power of unswerving loyalty and a real consciousness of national unity which will fill us with a dominant sense of patriotic loyalty to the United States."

Lodge & Shipley Methods

The Lodge & Shipley Machine Tool Co., Cincinnati, has issued a very attractive 8-page pamphlet describing its plant and shop system for the benefit of members of the American Society of Mechanical Engineers who will convene in Cincinnati May 21-24. The pamphlet states that the basis of the Lodge & Shipley shop system is the "Work Control Board". The lathes manufactured by the company are constructed in 39 standard units which are further subdivided into assemblies and subassemblies. In building a lot of lathes, the necessary quantities of all these various units are laid out and checked up on the "Work Control Board". This system is designed principally to control the machining and assembling of the necessary parts for a lathe, but its principles could be used to produce a motor, an automobile, or a locomotive.

In manufacturing lathes, the booklet continues the various types of machines used in the shop are grouped into departments. In the lathe department, a large number of manufacturing lathes, especially adapted for producing duplicate pieces without the use of measuring instruments, have been installed.

Medals Are Awarded

Awards of medals for notable accomplishments in safety work were awarded at New York, April 25 by the American Museum of Safety; the Pullman Co. received the Scientific American award for invention; the Commonwealth Steel Co. was awarded the Travelers Insurance gold medal for protection of employes; the Julius King Optical Co., New York, the Louis Livingston Seaman medal for the promotion of factory hygiene; the Connecticut Co., the three Anthony N. Brady medals for the street railway company best caring for its employes and patrons; and the Alabama Great Southern and Long Island railroads medals for efficiency in maintaining safety records.

The Manufacture of Steel Castings

Steel Foundrymen, in the Early Days of Their Industry, Were Forced to Solve Many Vexing Problems—A Record of the Rapid Growth of the Industry

BY ROBERT P. LAMONT

EVERY ton of steel produced by present methods may properly be called cast steel, but only a comparatively small percentage of this steel in its final form may be correctly described or referred to as steel castings. There would seem to be a rather small margin of difference between pouring the molten metal into an ingot mold preparatory to its being rolled or forged, and pouring the same metal into a mold in which it takes its final form and shape. Looking at it now, it doesn't seem as if it should require any great inventive skill to step from one process to the other. In principle it is a simple matter, but the practical difficulties were great and the developments of the cast steel industry were correspondingly slow.

Because of this rather narrow line between the first stage of ordinary steelmaking and what is in a sense the final stage of making steel castings, it is difficult to point out any definite place and date at which it can be said with certainty, "Here is where the making of steel castings began." In the large volume of literature on the early history of steelmaking there are practically no references to steel castings. The expression "cast steel" is frequently used, but it refers in every case to the pouring of the metal into ingot molds.

The probabilities are that the first castings were of simple form—such as could be produced in metal molds, and were no more difficult to make than ingots. As more complicated shapes were attempted, the necessity developed for a different kind of mold. The art, if it may be so called, was no doubt a gradual development, and no single name stands out prominently as the inventor of steel castings as now produced.

Developing the Industry in Europe

However, there seems to be no question but that the credit for making the first steel castings belongs to Germany. In the report of William P. Blake, our federal commissioner to the Vienna exposition of 1873, in describing the exhibit of the Bochum Steel Works in Westfalia, this statement is made: "One of the special operations in this works is the casting of steel in molds, after the invention of the technical director of the works, Jacob Mayer." Although the process was not patented in the country, it remained for 10 years the exclusive property of the company and of those works in France and England which had obtained the rights to manufacture.

How the First Castings Were Made

The steel in these early castings was melted in crucibles and cast in metal molds. Jacob Mayer is the only individual name mentioned in this reference to the early history of steel castings, but it is not clear from the report whether the technical director in 1873 was the originator of the industry which apparently started in 1851.

Immediately after the Paris exposition of 1867 the Terre Noire Works of France began a series of experiments to produce a metal to meet the requirements for projectiles for navy guns. They used a Siemens-Martin furnace, and the subject was gone into thoroughly from a metallurgical standpoint probably for the first time. A number of irons were tried with the addition of a certain amount of steel scrap before casting. The results showed that the addition of scrap improved the iron, but the variations in the breaking points of the steel were found to correspond with the amounts of silicon it contained. If the addition of steel scrap was pushed beyond a certain limit, blow holes began to appear. Experiments showed that projectiles made of this steel would not stand up in test. It was determined that to obtain steel without blowholes, a proportion of 11 to 12 per cent of pig containing 3.5 to 4 per cent of silicon should be added. This gave a hard metal and proved unsatisfactory. The metal was pasty, ran badly, and did not stand forging well. It was found necessary to add a certain amount of manganese in the initial bath, which made the slag sufficiently fluid to separate from the metal. It was of greatest importance to keep the oxidation as low as possible, and the process finally resolved itself to the employment of manganese and silicon in definite proportions and at regulated times. The metal was tapped directly into the molds, there being two tap holes, side by side, running into one spout fitted with two nozzles.

About this time, that is to say, about 1870, this company was producing all sorts of industrial castings, such as cast steel car wheels, frogs, roll-pinions, etc. It was not until 1875 that the Terre Noire company produced a cast steel shell which would go unharmed through armor plate. By 1879 this works was producing 200 tons of steel castings per month, about half of which consisted of projectiles for the French government. The elastic limit of the steel was about from 16 to 28 tons per square inch, with an elongation of from 2½ to 15 per cent.

At the Paris exposition of 1878, the Hadfield Steel Foundry Co., of England, exhibited double spur wheels, railway crossings, wheels, pulleys, hydraulic cylinders, etc.

Early Attempts in South

In the United States a few attempts were made during the Civil war to produce small field pieces of cast steel. A number of steel works are reported to have made steel castings for their own use during this period. The best information indicates that the first steel castings produced in this country, which were of value commercially, were made in July, 1867, by the William Butcher Steel Works, which afterwards became the Midvale Steel Co. These were crossing frogs for the Philadelphia & Reading railroad and were made of crucible steel. This was before the adoption of silicon for solidifying steel, and the castings were much honeycombed in all parts, except the wearing surfaces, which were solid and very smooth. The excessive sponginess of these castings, however, prevented their general use, although W. F. Durfee, who was superintendent in 1871, stated that they made quite a number of steel castings for reversible frogs, which varied in weight from 250 to 900 pounds.

Presented at the New York meeting of the American Iron and Steel Institute, May 25. The author, Robert P. Lamont, is president, American Steel Foundries, Chicago.

In 1870, William Hainsworth, of Pittsburgh, erected a small furnace having two crucibles, and made castings for the cutting parts of agricultural implements. He kept on experimenting until his capital was nearly exhausted, but in March, 1871, he incorporated a company and erected a plant at Pittsburgh. This was known as the Pittsburgh Steel Casting Co., and was one of the first steel foundries in the country. In making his molds, Mr. Hainsworth used ground coke mixed with ground plumbago crucibles, German clay, and all tempered with glue water. On this mixture he took out a patent.

First Open Hearth Steel Casting

In the latter part of 1874, Mr. Hainsworth had an open hearth furnace constructed, which in 1875 was used in making steel castings. These, I believe, were the first steel castings from the open hearth furnace in this country.

On April 28, 1876, the Midvale Steel Co. made two hammer dies of open hearth cast steel, and the next month made a hammer head weighing 2,535 pounds. The appearance of these castings was against them, as the surfaces were imperfect and the sand adhered to them in large quantities. There was also considerable trouble caused by piping and cracking. The first use of the bessemer process for making steel castings is said to have been made by Mr. Hainsworth in 1881. One writer during this period states that castings of plain section, weighing 100 pounds, sold as high as 20 to 25 cents per pound. However, from 1867 to 1880 the output of steel castings was very small.

Early Difficulties With Molds

Much difficulty was experienced with molding sand in these early days, and it was claimed that the Midvale people, for instance, lost money regularly on steel castings for years while trying one mixture after another. At first a molding mixture of ground brick, ground pots and fire clay was used. The next step was to leave the ground pots out of the mixture, and to wash the mold with finely ground clay fire brick. This made a marked improvement in the general appearance of the castings. However, the mold became hard, and intricate castings could not be made on account of cracks. Next, a mixture of sand and flour was tried, but there was a tendency for the flour to burn out. By 1887 a suitable mixture of sand and molasses had been obtained. George Cowing, Cleveland, is credited with first making a mold for steel castings composed of nearly pure silica, glue water and molasses. At this time all molds were baked in ovens, but efforts were being made towards perfecting a process to allow the casting of small shapes in green sand. This was probably first attempted successfully by steam founders in the St. Louis district, which had now become quite prominent in the steel-casting industry. In general, castings produced about this time were anything but satisfactory. In large castings particularly the earlier molds would burn onto the metal, or the metal would penetrate the molds in a spongy mass, requiring a great deal of labor and expense for chipping. Reference is made by writers in the eighties to pinions weighing 13,000 pounds requiring two weeks to clean, and on which there was a piece-work price of $2 per tooth. It must be remembered that at this time there were no pneumatic hammers. These first castings were hard, brittle and not homogeneous. They were so full of blowholes that one writer defined the ordinary steel casting as a rough chunk composed of about equal parts of steel and holes. The shrinkage problem was more difficult than with gray iron castings, and it took years of patient effort to overcome the difficulties involved.

Government Tries to Make Castings

Our own government was one of the first to experiment with and make extensive use of steel castings in this country, especially for battleships. Between 1880 and 1890 the English founders were successfully turning out stern frames, rudders and stem pieces. Our own people apparently had not acquired the same skill, for in his report for 1890 Engineer-in-Chief Melville, of the navy department, stated: "I am obliged to report we are having a most discouraging experience with steel castings." He further stated that when the first new vessels were being built, the steel founders claimed that they could cast anything in steel that could be cast in iron, but that there was then (1890) a wide diversity among steel founders as to what shapes were practicable for casting in steel.

In 1887 congress passed an act calling for the manufacture of three cast-steel, 6-inch, breech-loading rifles, to be made by the crucible, open hearth or bessemer processes, and to weigh approximately 11,000 pounds each. Only two were supplied, one of bessemer steel and one of open hearth steel. In the tests the bessemer gun failed at the second round. The open hearth steel rifle was cast by the American Steel Casting Co., Thurlow, Pa., and was not submitted to any mechanical treatment after casting. Although it stood the statutory test of 10 rounds under service charge, there was a slight increase in the diameter of the barrel after the tests and the government rejected the gun. Failure of these tests caused a good deal of comment at the time and discouraged further efforts along this line.

Railroads Use Steel Castings

Although at the present time a very large percentage of all steel castings produced in the country are used by the railroads, it is interesting to know that as late as 1885 very few were being used on cars or locomotives. At a meeting in Washington in that year, the Railway Master Mechanics' Association devoted some time to a discussion of their use. A number of the members were using steel castings for cross heads only, and on a few roads driving boxes, link hangers, eccentrics and rocker arms, in addition, were being made of cast steel. The Pennsylvania railroad specifications in 1888 for steel castings required tensile strength of 70,000 pounds and an elongation of 15 per cent in two inches.

At the Chicago exposition in 1893 there were exhibited by Krupp some steel castings which at that time were considered very remarkable, among them being a cast steel frame for a Pennsylvania railroad locomotive Stimulated possibly by this exhibit and by the growing demand, American manufacturers soon demonstrated their ability to make these frames, for five years later they were being generally used. These first frames were light and of simple design, as compared with those now made every day as a matter of ordinary routine. At the present time frames are not infrequently 34 feet long, and weigh up to 14,000 pounds. The percentage of loss in a good foundry does not exceed four.

Development During Recent Years

During the past 20 years the development of the steel-casting industry has been steady and rapid, although, of course, the production has had ups and downs following generally business conditions. Beginning with the nominal production of 1,684 tons in 1883, by 1897 the production had increased to approximately 100,000 tons. Today there are about 200 steel foundries in the country, with a total rated capacity of approximately 2,000,000 tons, though the actual production given for last year was probably about 1,500,000 tons. The exact figures are not yet available. The pro-

duction curve for steel castings for the past 20 years plotted alongside of one showing, for instance, the ingot production of the country shows a considerably more rapid rate of increase for steel castings.

While the product even yet cannot be said to be perfect, a great deal of careful, painstaking, intelligent study has been given to overcoming the difficulties in the processes, and it can at least be said that steel castings have to a large extent lived down the somewhat uncertain reputation earned during the first development period.

The past history of the steel industry has been about the same as that of most industries. The early experimental and development stage was difficult and unprofitable. In course of time a few successful businesses were developed and made money. After that there was apparently a too rapid expansion of capacity, excessive competition and no profit. Then followed the usual dropping out of the weak and the building up of the strong companies. During recent years, when general business conditions have been good, I think the industry as a whole has shown a fair margin of profit. Following policies and methods suggested and practiced by this institute, the larger companies have been more inclined to work on a "live and let live" basis. We have been exchanging information as to methods, comparing costs and undertaking in certain directions to adopt standard designs and specifications, all with the idea that by improving our methods and reducing our costs, we shall broaden the field of the industry and make more work for us all.

Turbo Blowers

(*Concluded from page* 1186.)

actual figures of cost of a turbo-blowing station which had been in use seven years—but adjusted by increasing them 25 per cent to represent November, 1916, conditions. The running charges for the turbo-generating apparatus are representative figures from central power stations, similarly adjusted.

Heat balances of furnace during average week day working hours are given below. There is a margin on the average for fluctuation of gas and load. The figures are as follows:

GAS ENGINE PLANT

	Million B. T. U. per hr.	Per cent.
Boilers	62	5.8
Electric station	380	35.3
Blowing station	88	8.2
Stoves	323	30.0
Margin	223	20.7
	1,076	100.0

The figures for British thermal units for the turbine plant are divided proportionally to the steam consumption, allowing 70 per cent boiler efficiency. These sub-divisions are nearly, but not exactly, comparable with the gas plant, the internal gas washing, electric and steam distribution being different. The figures are as follows:

STEAM TURBINE PLANT.

	Million B. T. U. per hr.	Per cent.
Pumps and miscellaneous	81	7.5
Turbo generators	420	39.0
Turbo-blowers	148	13.8
Stoves	323	30.0
Margin	223	20.7
	1,195	111.0
Deduct heat from coal	119	11.0
Heat from gas	1,076	100.0

This comparison based on the best gas engine figures for actual performance which have come to the authors' attention. The use of the figures from another and larger installation would render the use of make-up coal unnecessary except under circumstances which require its use in either plant.

The results show that, in the plants under discussion, the gas engine plant will cost nearly $4,500,000 in excess of the steam turbine plant. The operating cost, it is believed, will be about $550,500 per year more in case of the gas plant.

On the usual basis of computation used in considering the advisability of installing more economical units in our central power stations, the saving to be realized by the use of the steam plant would justify an excess first cost of $5,505,000, whereas the steam plant actually costs $4,422,000 less. No matter what differences of opinion or of fact due to locality or type of installation may be applied to these figures, it may be accepted as certain that wherever fixed charges are assessed against the power plant, the steam turbine will show a balance in its favor.

British Institute Meets

Iron and Steel Manufacturers of Great Britain Hold Successful Convention—Award Bessemer Medal

Birmingham, Eng., May 5, 1917.

ANDREW LAMBERTON, of Lamberton & Co., engineers, Coatbridge, Scotland, was presented with the bessemer medal at the annual meeting of the Iron and Steel Institute at London, England, May 3 and 4, in recognition of the various improvements which he had developed in rolling mill equipment. For patriotic reasons, Mr. Lamberton has for the present declined to receive the gold medal but accepted the diploma from Sir William Beardmore, president of the institute.

The meeting was surprisingly well attended in view of the war. It was shown that 125 members had joined the colors, of whom nine had been killed in action. A total of 86 additional enemy members, it was reported, had been removed from the roll, making a total of 107 in all during the war. The membership now is 1,872, of whom over 100 hold appointments under the ministry of munitions. A new class to be called associates will be admitted to membership. They will include engineering or metallurgical students and persons engaged in some practical capacity.

After consultation with Mr. Carnegie, the council of the institute has decided to suspend the age limit of 35 years of applicants to the Andrew Carnegie research fund. This is due to the fact that applications have been coming in very slowly since the war. At a subsequent session a number of grants from the Carnegie research scholarship funds were announced. The Carnegie fund investments in American securities have been reinvested in British bonds.

The subject of refractory materials occupied the opening session. Cosmo Johns, of Sheffield, discussed "Properties of the Refractory Materials Used in the Iron and Steel Industry", and deplored the prevailing ignorance on this subject. Dr. Bone pointed out where Germany and the United States led England in their appreciation of the importance of such knowledge. Others who discussed the topic were Sir Robert Hadfield, James Dennolchie, of Coatbridge; Dr. Arnold, of Sheffield University; H. M. Ridge, E. H. Saniter and others. Professor Turner referred to the fact that on the continent and in the United States scientific experiments with refractories were carried out most carefully.

"Steel Ingot Defects" was discussed by J. N. Kilby, of Sheffield. Dr. Hadfield stated that several investigators, including himself, had proved that assuming the slag to consist of silicates, as they reduced the carbon they sent up the silicon content and so arrived at a position of equilibrium; and so with a further reduction of the iron content, the silicon was sent up so high that the silica was split up and the silicon went back into the steel.

Steel Men Will See Ships Through

Pledge Their Product and Services to Government to Combat Submarine Scourge—General Goethals Pronounces Wooden Ship Proposal to be Hopeless—Patriotism Dominates Historic Iron and Steel Institute Meeting

AMERICAN iron and steel makers met the call of their country and pledged their product and their services to the cause of a successful war at the twelfth meeting of the American Iron and Steel Institute at the Waldorf-Astoria, New York, Friday, May 25. The occasion without question was the most important and historic in the life of the organization; the meeting was the largest ever held, with an attendance of approximately 850; it marked the full tide of a period of the most remarkable prosperity ever known; and, with the nation, in armed conflict, it framed the answer of the industry to the challenge to pit its creative strength against the destructive handicraft of the nation second in size and capacity as to steel power only to itself. In closing the meeting, Judge Gary characterized the day as the greatest in the history of the Institute.

The climax came at the banquet when Major General George W. Goethals, charged by the government with the gigantic task of building within record time, a great fleet of vessels to combat the German submarine, called for united support from the steel makers without which success was impossible. The effect was instantaneous. The manufacturers rose to their feet in a body in response to a word from Judge Gary and amid wild cheering enlisted their plants and their energies in the stupendous enterprise.

General Goethals was given a most enthusiastic reception. In his short, incisive address he pronounced the impossibility of building wooden ships in the millions of tons proposed. He told of the situation when called to the government's service. "I was confronted with the problem of turning out 1,000 3,000-ton wooden ships in 18 months," he said. "It was said the steel could not be procured. I found contracts to build these ships had been promised in all directions. When I looked into the plans and specifications, I found none. When we consider that the birds now are nesting in the trees that are to go into these ships, and that these ships must have a speed of about 10½ knots an hour, if they are to escape the submarines, the proposal was simply hopeless."

General Goethals told how he had gone to New York and had consulted with Mr. Farrell to see if the steel for the desired tonnage could not be obtained in some way. Mr. Farrell assured him that it could. Then General Goethals undertook the great ship building task. A second conference brought the assurance from Mr. Farrell and the Steel Corporation that they would stand behind him. "Right here I want to ask the American Iron and Steel Institute to get back of Mr. Farrell and assist in getting the 3,000,000 tons," said General Goethals. "I want to enlist the co-operation of the structural steel manufacturers to go into the fabrication of ships as well as the building of ships. I want the co-operation of the builders of machinery, chains, anchors and everything that goes into a ship. If, as Lloyd George says, ships will win the war, then whoever helps build ships will help to terminate the war."

George W. Perkins presenting "The Man of the Future" contrasted the relations of government and business in this country and in Germany. At the same time this country was adopting the policy of intensive competition. Germany was taking up the doctrine of co-operation, with which she has accomplished so much. The test after the war will be whether the United States will be the new or the old world modeled on the efficiency of Germany. He deplored the lack of interest in public life of business men. He declared the man of the future would be he who would best serve the interests of the country, best relate capital and labor, and best discharge his stewardship to his stockholders and company as personified by Judge Gary. John A. Topping responded to the subject "Co-operation and the Mobilization of Public Sentiment".

Harry P. Stoddard of the Weyman-Gordon Co. in a ringing speech prophesied that the future reward of business would be recognized fully by public sentiment and government of its loyal co-operation in war and that it would be accorded the dignity in times of peace which it has had in times of war. Moreel Knecht representing the French business commission in this country expressed spiritedly the debt owed by France to the American steel makers, when deprived of her richest ore and steel works in Lorraine, she was forced to come to the United States for war material to repel the German invader. "It has been American steel against German steel and American steel has proved the stronger," he said. Others who spoke were Knox Taylor of the Taylor-Wharton Iron & Steel Co., A. F. Huston president of the Lukens Steel Co., Emil Gathman of the Gathman Engineering Co., Baltimore, and R. B. Carnahan of the American Rolling Mill Co., Willis King of the Jones & Laughlin Steel Co., paid a beautiful eulogy to the late James H. Hoyt. The members stood in silence for a moment as a tribute to Mr. Hoyt's memory.

Prefacing his formal address, at the opening session, Judge Gary reviewed the business situation. "The country may congratulate itself that it has an institution of this kind made up of the class of men constituting its membership," he said. "In my formal remarks I have made no reference to business conditions. With you, I feel that business, strictly speaking, must be more or less disregarded, when confronted with the great questions which will affect all of us in our personal contemplation of the world outlook. I think all of you are satisfied that as far as our industry, business has been extraordinarily good. Demand for our products is great, prices offered and made by purchasers are higher than they have been for many years and prospects for the immediate future and as far ahead as we can see, are excellent. Naturally all of us are looking forward with much anxiety. No one can tell what the future will bring forth. Nevertheless and notwithstanding the enormous drains on us for war purposes we must not forget that this money is to be expended in this country and will remain here and that we have such a large volume of cash and cash assets as this country or any other country ever witnessed. Because of this extraordinary condition we may expect and hope that with fair management and business prosperity for a year or two will not be materially interfered with and I feel very hopeful of the future." Judge Gary's formal address was applauded vigorously.

Judge Gary announced the personnel of

the general committee and various sub-committees of the Institute which are carrying out the co-operation with the government. The make up of some of these committees previously had been announced but the list complete is given herewith.

General Committee — Elbert H. Gary, chairman, James A. Farrell, vice chairman, James A. Burden, E. A. S. Clarke, Alva C. Dinkey, Willis L. King, Charles M. Schwab, John A. Topping.

The general committee has appointed the following sub-committees:

For Ascertaining Capacities and Supervising Allotments of Orders to Manufacturers—James A. Farrell, E. A. S. Clarke, J. A. Topping, E. H. Gary, ex-officio.

Alloys—J. A. Farrell, E. A. S. Clarke, A. A. Fowler, E. G. Grace, E. J. Lavino, E. H. Gary, ex-officio.

Iron Ore, Pig Iron and Transportation—H. G. Dalton, Frank B. Richards, Harry Coulby, C. D. T. Dyer, W. T. Shepard, G. H. Woodward, Leonard Peckitt, Frank Billings, Amasso S. Mather, secretary.

Sheet Steel—W. S. Horner, Charles O. Hadley, Walter C. Carroll.

Scrap Iron and Steel—Eli Joseph, Samuel Deutsch, Vernon Phillips, Joseph Michaels.

Pig Tin—John Hughes, E. R. Crawford, Edwin Groves.

Tin Plate—J. I. Andrews, E. R. Crawford, E. T. Weir.

Tubular Goods—James A. Campbell, others to be named later.

Robert Hobson of the Steel Co. of Canada, Ltd., told of the gratification felt in Canada that the United States had joined forces for the causes of right and civilization and of the wonderful contribution in war power the dominion had made in the present struggle.

The program of prepared papers included "Recent Installation of Large Turbo Generators," by Richard H. Rice, General Electric Co., discussed by D. S. Jacobus, of the Babcock-Wilcox Co., and by Alexander Dow, president of the Detroit Edison Co.; "The Manufacture of Steel Castings", by Robert P. Lamont, president of the American Steel Foundries Co., discussed by S. P. Bush, president of the Buckeye Steel Castings Co., and R. F. Flinterman, of the Michigan Steel Castings Co., Detroit; "The Relative Merits of Forming Steel by Pressing, Hammering and Rolling", by John Lyman Cox, of the Midvale Steel Co., discussed by E. O'Conner Acker, of the Bethlehem Steel Co.; "The Chemical Reactions of Iron Smelting", by Walther Mathesius, superintendent of blast furnaces, Illinois Steel Co., discussed by Henry P. Howland, and "Surgical Discoveries of the War and Their Application to Industrial Accidents, Humanitarian and Economic Features", by Dr. W. O'Neill Sherman, chief surgeon of the Carnegie Steel Co. Dr. Sherman's paper, which was illustrated by slides, set forth the wonders of the Carrel method of dressing wounds, and of a new treatment for burns, and created a profound impression. John A. Penton, lately returned from France, paid a high tribute to the labors of Dr. Sherman as being responsible for the compulsory enforcement of these treatments by the French government.

Steel Men Give Vent to Their Patriotism

Patriotism was rampant at the Institute sessions. Judge Gary sounded the key note in his address and introductory remarks. At the opening of the afternoon session, led by Joshua A. Hatfield, president of the American Bridge Co., the members standing sang "My Country 'Tis of Thee", with great fervor. The speaking program at the banquet was inaugurated by Judge Gary, calling for a toast to President Wilson. As the 850 diners standing raised their glasses, the hall was suddenly darkened and a spot light was projected upon a large American flag fluttering at its staff while the orchestra burst forth and the whole assemblage joined in the strains of "The Star Spangled Banner". The Marseillaise was played and sung repeatedly at the banquet and shared honors with the patriotic American airs. Behind the speakers' table was a great festoon of national colors flanked on one side by the French tri-color and on the other by the Union Jack.

"Approximately 75,000 deaths result annually from accidents in the United States," said Dr. Sherman. "In 11 months of the year 1916, there were 25,000 accidental deaths with 225,000 accidents in Pennsylvania. Many of the deaths were the result of wound infection, approximately 10 to 15 per cent of the wounds received were infected.

"The problem of controlling wound infection had never been satisfactorily solved until the discovery of Doctors Alexis Carrel and H. D. Dakin. Dr. Carrel recognized at the very beginning of the war that control of infection was the great surgical problem that confronted the surgeon. Dr. Dakin succeeded in making a solution with intense antiseptic properties, which is non-irritating and does not destroy the tissues. The antiseptic is introduced into the wound through a number of small rubber tubes with small perforations staggered along their walls so as to allow the solution to be equally sprayed into all parts of the wound.

"Dr. Chutro, professor of surgery at the University of Buenos Aires, who has been surgeon to the Hospital Buffoon, Paris, for the past two years, states that where formerly he performed 20 amputations, only one now is necessary and where there were from 12 to 15 deaths from infection, he now has one. These wonderful results were secured by using the Carrel method.

"It will readily be seen that Carrel's and Dakin's discovery is going to be of tremendous value to industrial America. It will not only save a great number of lives and amputations but will enable the injured to return to their former occupations two or three times more quickly than heretofore. The method is being rapidly adopted in this country and it will be but a short time until the surgeons in every industrial corporation in the United States will be using it.

"Another surgical discovery which will be of great use to the industrial surgeon, is the discovery of a new method of treating burns. This method consists in the spraying or painting of a liquid paraffin, bees-wax and resin mixture directly over the burn.

"Had it been possible to introduce these treatments and make their use compulsory in the allied armies two years ago, at least 150,000 lives and 75,000 amputations could have been saved."

E. A. S. Clarke presented a communication from the United States Chamber of Commerce outlining plans now being formed at the instance of the national council of defense for caring for the dependents of employes who are enlisted for active service. It is proposed that this be done by the federal government, and directed through a central body, in order that there be uniformity in various industries. This, it has been found from the experience in Europe, is very desirable from various viewpoints. It was the desire of those directing the movement that the iron and steel industry be informed of the undertaking so that individual action would not be attempted.

At the meeting of the directors, the old officers were re-elected for the ensuing year. Cincinnati was awarded the October meeting. It was decided to suspend the dues of all members during the period of active military service.

Judge Gary Analyzes War Problems

In Address at Institute Meeting, Chairman of Steel Corporation Places Responsibility for the War, Discusses Taxation, Commends Washington Officials and Predicts Complete Co-operation of Steel Manufacturers

THE patriotic tone underlying the meeting of the American Iron and Steel Institute, was clearly sounded in the address by President Gary. After a clear analysis of the events which forced this country to take up arms against Germany, President Gary pointed out some of the difficulties which must be overcome in order to bring the war to a successful conclusion. He discussed the patriotic nature of the measures which iron and steel manufacturers have already taken to promote the successful prosecution of the war and urged upon all the imperative need of facing the task with the full consciousness of its importance and of the sacrifices which the war will necessarily entail.

"What are we fighting for?" asked President Gary. "This question is asked and answered, in one form or another, by millions of people. I give an answer that seems to me to underlie all others: We are fighting to firmly establish and permanently maintain a basis whereby every international question in dispute must be determined in accordance with the principles of justice.

"The task which confronts the country is not confined to the army and navy, although they will be entitled to the larger part of the credit and glory if we succeed. They offer their bodies as a sacrifice, and they must have the undivided, unqualified support of all outside their ranks. The time, money and prayers of all civilians must be given for the soldiers. They bear the brunt; they are the shield for our safety. All of us are fighting in self-defense. This is our land and the flag is ours. The administrators of the country, from President Wilson down, are no more interested than each of us. Life would not be worth living if our flag were to be permanently furled; if our country were subjugated by an alien enemy, especially such a one as we now defend ourselves against."

Judge Gary continued as follows:

The people of the United States constitute a peace-loving nation. They abhor war and would go, have gone, great lengths to avoid it. They are considerate, reasonable and forbearing. They are not envious of their national neighbors. They neither seek nor desire anything that belongs to any other country. If they had an advantage over other nations, in any department of human endeavor, they would not unjustly profit by it. Their ambition is to cultivate good will and friendship and their hope is to avoid enmities. Their consistent purpose and effort have been to occupy an independent position amongst nations, unentangled and uncomplicated with alliances or associations that might interrupt the policy of aiding and never antagonizing others.

These observations are based on history. The record has been written and cannot be changed by any who may impugn the motives or conduct of our people. Such a citizenship when driven into the corner of self-defense is apt to be the most terrible, even though civilized and human in its combativeness, when attacked by a barbarous despotism.

We did not desire, we persistently and consistently sought to avoid, trouble with Germany and her allies. We had always been the true friends of the Teutons until the ruling powers, for reasons not comprehended by us, forced us into the position of self-defense. We believed, as indeed it was admitted by the invaders, that they were reckless, lawless and cruel in their treatment of their neutral and unoffending neighbors, but as a nation we refrained from interference or even criticism. As human beings we suffered intensely as we learned of the outrages perpetrated upon the innocent victims of force and brutality; and still our nation, not for lack of sympathy, but rather on legal grounds, stood aloof.

We were neither indifferent nor selfish, but our President, after full and careful consideration of all the facts and the construction of the rules of international law as determined by the best legal talent, decided he was obligated to remain silent and inactive. For one, I think his conclusions were warranted.

Even after the central powers trespassed upon the well established rights of the persons and property of individual American citizens, our government was patient and unmoved to action, accepting the excuses and promises of the aggressors. As a nation we exercised more restraint than any large and powerful people ever before practiced under provocation so great. Our chief executive indulged the hope for long and weary and suffering days that our entry into the pending war might be avoided. The wish was father to the thought; and this sentiment filled the minds of the majority of the people of the United States.

At last war was forced upon us. The President was compelled to conclude that we were intentionally attacked, that the honor and integrity of our country could no longer be maintained unless the gage of battle was accepted; and in this decision he was supported by the whole country. His clear, powerful, convincing and eloquent statement of the case and impeachment of the enemy will stand out in history as one of the greatest official declarations and also as fully justified by the existing facts and circumstances.

Some or all of the South and Central American republics, China, Spain, Scandinavia, Holland and Switzerland ought

Right vs. Might

"And yet, the allies possess an element of strength not appreciated—if it could under any circumstances be understood—by those who are in control of the armies of the central powers. The allies are contending that right makes might; their enemies that might makes right. We are of the opinion that we possess a weapon that must prove all powerful. With this as the foundation and inspiration of our armies they are better able to utilize all the forces at their command. It will require time, skill, numbers, sacrifices and large sums of money; but nothing that we do not possess in abundance. For the reason that we are right and the enemy is wrong, we shall probably see other nations of strength and importance, now neutral in attitude, join the allies, if the war shall be protracted."—From Judge Gary's address.

to come in and probably will before the central powers are allowed to accomplish what they attempt.

With the unprecedented and increasing wealth and the vast resources of the United States she is able to assist materially in providing the financial necessities for equipping multitudes of soldiers from other countries; and if necessary, all these must be mobilized in the defense of a common and righteous cause. And as to equipment, the brains of the allies, ourselves included, will, in time, be sufficient to match and overmatch the best talent that is possessed by our adversaries after many years of constant thought and study. Among other things it is conceivable that if the allies had the best and most effective types of aircraft, outnumbering those of the other side five or ten to one, they could obtain and hold control of the air and in this way destroy the productive works, transports of troops and supplies, storage warehouses and other facilities for offensive and defensive warfare of the enemy, and thus materially increase the advantage now held by reason of numbers and resources. We may be sure our experts are giving due consideration to all the possibilities for improved machines and methods.

The pecuniary burdens to be imposed upon us will be very great. We knew in advance such would be the case. We must pay the enormous cost of mobilizing, equipping, supplying and moving our own armies; and we must advance money and provide supplies to our allies in accordance with their necessities and our resources. We could not decline if we were disposed, for they are now fighting our battles and we are, with them, under the whole burden. We must never falter nor retrace our steps.

Wherever or whenever the end is we must press forward with all our strength, might, minds and souls. The more vigorously we proceed within the limits of intelligence, the sooner will the end be reached.

Now is the time to unite the whole country in a common cause. The soldiers are on a level as they ought to be. All others should be on a level. Classes should be obliterated and also politics, localities and religious differences during war times at least. Opportunity should be open to all; governmental burdens should be borne by all. With such an administration of governmental affairs we should be satisfied, however severe the drafts which are made upon us or upon the larger interests which we represent.

I lately spent a few days in Washington, and it was my privilege to meet a number of men who in legislative halls or executive departments are serving their country; and it is certain that all are actuated by the motive to fairly represent and protect the best interests of the country and all the people. Individuals are not influenced by politics. There are and will be differences of opinion concerning the various questions presented, as a matter of course, but these will be adjusted and the legislation finally passed will represent an honest endeavor to do what is proper.

The secretary of the navy submitted a program for 1917 for plates, structural shapes and bars needed for ships, and after considerable negotiation, contracts were closed in behalf of the producers on the basis of $2.90 for plates and $2.50 for structural shapes and bars.

We were of the opinion that in view of present costs and other conditions we should receive larger prices, but in the spirit I have referred to, the proposition of the government was accepted. As costs of production are advancing on account of increases in wages, taxes, prices of certain raw materials, etc., it is expected the government will be willing to increase its purchasing prices accordingly.

The iron and steel fraternity, represented by this Institute, will be actuated by the highest conception of patriotic duty with respect to the requirements of the government. We will cheerfully bear our full share of the load which must be carried until there is realized a complete triumph over the hosts of aggressive, desperate and inhuman autocracy. Personal interests will yield to the necessities of the country we love.

How to Levy Taxes

"Some of us are complaining or criticizing because of the enormous taxes that are likely to be imposed. We are apt to consider ourselves as opposed by the legislative or executive departments of the government, as if they were partisans, seeking to punish or at least unfairly treat the private individual. We do ourselves an injustice by harboring such thoughts. We can rightfully claim that the burden of taxation be equitably distributed; that all the people, after exempting the necessities of life, shall be compelled to contribute; and that there shall be no waste or extravagance in making expenditures. Taxes ought to be levied and distributed if possible so as to avoid clogging the channels of business prosperity. All this we may properly demand. Equitable distribution is fair and reasonable, and it makes all pecuniarily interested in the subject, including both the collection and the expenditure of the taxes levied. Less than this would tend to create classes—the worst thing for any country."—From Judge Gary's address.

Test of Co-operation

"You have heard some criticism concerning the conduct of the government's business affairs. It has been said that confusion or at least lack of system or co-operation sometimes appears; but it must be remembered that there has been suddenly thrust upon the government officials an enormous amount of business, extraordinary in volume and character, and the strength and capacity of all are taxed to the utmost and often beyond physical endurance. Besides, rules of law or of departments established to fit other conditions sometimes appear and prevent the exercise of judgment which would bring better results if more latitude were permitted. Officials in Washington are entitled to credit and praise for their management under existing circumstances, and so far I believe there is no just ground for severe criticism.

"And then there is a disposition on the part of government officials to co-operate with the business men in promoting the welfare of the country. This is what all of us have desired and advocated, and now we will probably have as much opportunity in this direction as we have ever desired. Just what will be the result in all the ramifications of the business involved remains to be seen. To the extent that the directors of this Institute have been personally connected with these matters they have been well satisfied, except perhaps as to some of the prices in question."

A Colossal Task

"But we have entered upon a colossal undertaking, justified only by the necessities of the case and on the highest moral grounds. It is doubtful if any of us fully realizes the strength of the enemy, even though we know his grim determination. His numbers, his preparedness, resources, devices, creative ability, methods, protective barriers, means of rapid mobilization and transfer of troops and supplies, are further advanced in effectiveness than any other army or armies have ever been. This concentration and perfection of the utilities of military strength should not be underrated. Years of steady, active and studious, though secret, effort have brought about the creation of a giant, powerful, remorseless, conscienceless; and up to the present this kind of a government, armed to this extent, seems to have an abiding conviction that it can overcome all opposition and sooner or later pursue a war of aggression and conquest."—From Judge Gary's address.

Defense Council Worries Congress

Authority of National Council is Questioned by Jealous Legislators—Interstate Commerce Commission is Augmented by Two New Members—Shipping Board Turns Down Per Cent of Cost Plan

WASHINGTON, May 28.—Congress continued last week to show concern over the activities of the advisory commission, council of national defense, as well as over the plans it is said to have under way. Both in the house and in the senate repeated protests are being made that the commission has assumed power that has not been vested in it and can not be except by legislation. In some quarters there seems to be a movement progressing which is designed to cripple the commission's efficiency. One of the main criticisms made of the organization is that, while it is not exercising privileges unduly, it has not made members of congress as closely acquainted with its work as it should. Another point made is that there are members of congress who are excessively jealous of their pregrogatives and feel that the slightest action taken by the advisory commission, as well as its parent body, the council of national defense, should be preceded by congressional approval. The absurdity of this particular claim is patent when it is considered that the council and commission both have to deal with many matters of confidential character in connection with the war and that it would largely invalidate their work if it were subjected to public discussion in the halls of congress.

Considerable support, however, is being given to objections raised against the alleged plan to make Bernard M. Baruch, present chairman of the commission's committee on raw material, head of the proposed purchasing commission of five men who would have charge of buying all supplies for the government of the United States and its European allies. To those believing that Mr. Baruch has had no experience warranting his elevation to such a highly responsible position it seems incredible that he should be given such an office. Moreover, members of congress assert that the proposed commission could not be named in the absence of authority from congress. Mr. Baruch's dealings with such business men as steel manufacturers and copper producers, by which prices for those products for government use were reduced, are said to have been successful solely because of the willingness of the manufacturers to make price concessions on behalf of the government.

Strangely enough, however, Mr. Baruch was criticized in the house last Thursday by Speaker Champ Clark because he did not force down the price of copper to less than 16c per pound, the figure at which it is being supplied to the war and navy departments. Representative Moore of Pennsylvania had made a statement that it had been announced that under the auspices of the advisory commission of the council of national defense the task of spending $10,000,000,000 a year is to be imposed on one man — Mr. Baruch. That, he said, apparently had the sanction of the council. He inquired how any body can spend $10,000,000,000 or any other sum of money without the sanction of congress. Representative Lunn of New York, resenting an attack made on Mr. Baruch by Representative Moore, stated that Mr. Baruch has saved millions of dollars to the government. Occasion was also taken by Representative Lunn to commend the men in the steel and copper industries for being willing at this time of national crisis to give the government such favorable prices.

"You say that Mr. Baruch got a price of 16c for copper," said Speaker Clark. "Do you know that the Utah Copper Co. in its report to its stockholders, declared that they could put copper f. o. b. the cars at 5⅛c a pound?

"If that is a fact, and I do not want to question the statement made by the gentleman from Missouri," replied Representative Lunn, "then we have made a tremendous mistake in our revenue bill that we did not put on an excess profits tax that would have raised nearly all the revenue needed."

"I think that, too," said Speaker Clark. "But the Utah Copper Co. made a report to its stockholders that they could put copper on board cars at 5⅛c a pound, and Mr. Baruch thinks we have brought it down to 16c."

"But without Mr. Baruch we would have been paying 30-odd cents a pound," Representative Lunn contended.

"I will ask you another question, then," Speaker Clark said. "Why does not the attorney general of the United States hop on to those fellows that put it up to 30c? I am willing to give Baruch credit for pulling it down from 30c to 16c, but he did not pull it down far enough, and the attorney general could put every one of those fellows into jail between now and Sunday night who kept the price up.

"I know something about the cost of producing copper, and I happen to have some personal knowledge of the way in which the offer was made to the government by which the government will receive the copper, upward of 50,000,000 pounds, for about 16c a pound." Representative Miller of Minnesota said. "I want to state fairly and squarely and emphatically that Bernard M. Baruch had nothing whatever on earth to do with it. He is entitled to no more credit for it than the man in the moon. The offer on the part of the copper company to supply this copper to the government for 16c or thereabouts was really a voluntary one on the part of the big producers of copper. Many of the big producers of copper have enjoyed enormous profits during the period of this war. There is not a shadow of doubt about that. They have enjoyed profits that exceed anything they had ever dreamed of. Not very long ago copper was selling for 10, 11 and 12c cents a pound, although in 1907 it is true that it went up to 25 or 26c a pound. These men who have made enormous profits in copper, realizing the exigencies of the situation, did have patriotism enough in their hearts to make this voluntary offer to the government, and they should receive such credit as is their due."

"As to 5⅛c a pound being the cost of producing copper," said Representative Miller, "in Utah by the Utah Copper Co., that is probably true. The Utah Copper Co., he said he had been informed, can produce copper more cheaply than it can be produced by any other company or men in the world—vastly cheaper." "I think the testimony usually has been," he concluded, "that it costs on an average somewhere between 13 or 14c a pound to produce copper, but the price that the Utah Copper Co. can produce it for I have always heard was around 7 or 8c. It is altogether likely that they have been able to produce it more cheaply by perfecting their system."

Commerce Commission is Reorganized

Washington, May 28.—Increased duties devolving upon the interstate commerce commission and growing out of the war situation acted as a stimulus which prompted the senate to pass a bill last Wednesday afternoon enlarging the membership of the commission from seven to nine. A similar measure passed the house at the sixty-fourth congress and it is

expected no difficulty will be experienced in having it passed in that body again.

Not only is the membership of the commission enlarged by the legislation, but the procedure of that organization is radically changed to expedite the extremely important and numerous transportation problems coming before it. The bill authorizes the commission to divide itself into as many parts as it may deem necessary and "any order, decision, or report made or other action taken by any of said divisions in respect of any matters so assigned or referred to it shall have the same force and effect, and may be made, evidenced, and enforced in the same manner as if made or taken by the commission as a whole." It will be the plan of the commissioin, it is believed, to divide itself into three units as a general thing, each division sitting in proceedings in as many sections of the country, and thus accomplishing three times as much work as is now performed by the commission under its present organization which requires that each commissioner participate in the findings in any given case.

The so-called service shortage bill was acted upon by both branches of congress last week. The house concurred in amendments to the measure adopted by the senate, and added a minor amendment. This legislation was considered as a war measure because it authorizes the interstate commerce commission to establish reasonable rules, regulations and practices with respect to car service, including the classification of cars. Compensation is to be paid for the use of any car not owned by carriers affected by orders of the commission. Whenever the commission shall be of the opinion that necessity exists for immediate action regarding the supply of cars, it can, at once, suspend the operation of all rules, regulations, or practices then established as to car service. The directions of the commission may be made through agents or agencies designated by the commission. This will permit of co-ordinated work between the commission and the railroad committee of the council of national defense, which is exercising sweeping powers to readjust the transportation problem to a war basis.

This bill was urged upon the plea that the transportation system of the United States for months has failed to meet the requirements of trade. Cars, it was contended, have not been equitably distributed, and it was held that this was due in large part to a lack of system in the movement, distribution, exchange and interchange and return of cars. There seems to be an utter lack of spirit of accommodation among the different railroad systems, according to the committee's report, in the return of cars to the owning companies, with the result that many cars have been lying idle when they should be moving. This, it was claimed, caused the public to suffer unnecessarily, and has prevented producers of food, fuel, etc., from transporting products to consumers. Car service rules adopted by the American Railway Association, the committee said, were not observed, and in consequence it was held to be necessary that congress take action and vest plenary power in the commission. Another piece of pending legislation which is coupled with the war situation, authorizes the President to direct the railroads to give priority movement to designated shipments, which would include such products as food, munitions, etc.

Revisions Made in Ship Building Plans

WASHINGTON, May 28.—Definite decision is understood to have been reached by the United States shipping board not to award contracts for the steel and wooden merchant vessels to be built under its direction on a basis of cost plus a certain percentage of profit. Instead, the board is reported to have determined that all work shall be let under straight contracts. While it has been claimed that the board might let contracts under both plans, the reported decision to forego the one as to cost plus a percentage of profit was reached following a closer study of this form of contract. Following this investigation, the board apparently reached the conclusion that the straight contract is the more desirable. Lumber interests not engaged in government work support this belief, stating that they had found when going into the market for labor, for instance, the cost had been enhanced by reason of concerns taking contracts from the government upon a basis of cost plus a certain percentage. It was pointed out that contractors having this kind of agreement with the government have no interest in keeping down either the cost of labor or material, but that, on the contrary, the higher the costs were it naturally followed that the percentage of profit became greater. Cases of this kind, however, are said to have been found only in isolated instances. The navy department, which has awarded many vessels on a basis of cost plus a percentage of profit basis has had no difficulty with this form of contract, according to report, but instead the department and ship builders are in complete accord, except possibly with regard to unimportant details of costs.

Plans are Moving Swiftly

The shipping board is unable to announce when it will be able to issue completed plans for all the types of standardized steel ships it is to build. Comparatively rapid progress is being made along this line, as are plans for building new yards for the construction of the vessels. The exertions being made in this direction by the American Bridge Co., announced last week, have not come with surprise here in circles which have heard that this company was planning to take an extremely active part in helping to carry out the government's merchant ship building program.

The American company reported plans to build a yard at Hackensack Meadows, on Newark bay, where it will build standardized cargo boats ranging from 5,000 to 8,000 tons, as well as steel bottoms for cargo boats to be used in the barge canal. It is reported that this company proposes to turn out one 5,000-ton vessel a day after six months. Moreover, the report is accepted as being confirmatory of statements that the United States Steel Corporation has promised the shipping board that large tonnages of structural steel will be supplied each month in order that no time may be lost in carrying out the ship building program.

It was due to the response of steel manufacturers throughout the country that the navy department has been able to get steel for its building program without delay. Secretary Daniels in a statement issued last week regarding contracts for naval ships said that yards have had considerable difficulty in getting certain materials, especially steel, and in order to aid them and expedite the work the department has "arranged to get the plates and shapes to them promptly and at the comparatively low prices at which the manufacturers are furnishing steel to the government at the present time."

Production of Steel Ingots and Castings and Finished Rolled Iron and Steel

Statistics Compiled by Bureau of Statistics, American Iron and Steel Institute

TOTAL PRODUCTION OF ALL KINDS OF FINISHED ROLLED IRON AND STEEL, 1887–1916.

Years	Iron and steel rails.	Plates and sheets.	Nail plate.	Wire rods.	Structural shapes.	All other finished rolled products.	Total. Gross tons.
1887.	2,139,640	603,355	308,432	.....	.....	2,184,279	5,235,706
1888.	1,403,700	609,827	289,891	279,769	.....	2,034,162	4,617,349
1889.	1,522,204	716,496	259,409	363,851	.....	2,374,968	5,236,928
1890.	1,885,307	809,981	251,828	457,099	.....	2,618,660	6,022,875
1891.	1,307,176	678,927	223,312	536,607	.....	2,644,941	5,390,963
1892.	1,551,844	751,460	201,242	627,829	453,957	2,579,482	6,165,814
1893.	1,136,458	674,345	136,113	537,272	387,307	2,104,190	4,975,685
1894.	1,021,772	682,900	108,262	673,402	360,305	1,795,570	4,642,211
1895.	1,306,135	991,459	95,085	791,130	517,920	2,487,845	6,189,574
1896.	1,122,010	965,776	72,137	623,986	495,571	2,236,361	5,515,841
1897.	1,647,892	1,207,286	94,054	970,736	583,790	2,497,970	7,001,728
1898.	1,981,241	1,448,301	70,188	1,071,683	702,197	3,239,760	8,513,370
1899.	2,272,700	1,903,505	85,015	1,036,398	850,376	4,146,425	10,294,419
1900.	2,385,682	1,794,528	70,245	846,291	815,161	3,575,536	9,487,443
1901.	2,874,639	2,254,425	68,850	1,365,934	1,013,150	4,772,329	12,349,327
1902.	2,947,933	2,665,409	72,936	1,574,293	1,300,326	5,383,219	13,944,116
1903.	2,992,477	2,599,665	64,102	1,503,455	1,095,813	4,952,185	13,207,697
1904.	2,284,711	2,421,398	61,601	1,699,028	949,146	4,597,497	12,013,381
1905.	3,375,929	3,532,230	64,542	1,808,088	1,660,519	6,398,107	16,840,015
1906.	3,977,887	4,182,156	54,211	1,871,614	2,118,772	7,383,828	19,588,468
1907.	3,633,654	4,248,832	52,027	2,017,583	1,940,352	7,972,374	19,864,822
1908.	1,921,015	2,649,093	45,747	1,816,949	1,083,181	4,311,608	11,828,193
1909.	3,023,845	4,234,346	63,746	2,335,685	2,275,562	7,711,506	19,644,690
1910.	3,636,031	4,955,484	45,294	2,241,830	2,266,890	8,475,750	21,621,279
1911.	2,822,790	4,488,049	48,522	2,450,453	1,912,367	7,316,990	19,039,171
1912.	3,327,915	5,875,080	45,331	2,653,553	2,846,487	9,908,475	24,656,841
1913.	3,502,780	5,751,037	37,503	2,464,807	3,004,972	10,030,144	24,791,243
1914.	1,945,095	4,719,246	38,573	2,431,714	2,031,124	7,204,444	18,370,196
1915.	2,204,203	6,077,694	31,929	3,095,907	2,437,003	10,546,188	24,392,924
1916.	2,854,518	7,453,980	30,088	3,518,746	3,029,964	15,493,093	32,380,389

PRODUCTION OF STEEL INGOTS AND CASTINGS BY PROCESSES.

Years	Open-hearth.			Bessemer.	Crucible.	Electric.	Miscellaneous.	Total. Gross tons.
	Basic.	Acid.	Total.					
1902.	4,496,533	1,191,100	5,687,729	9,138,363	112,772	.....	8,386	14,947,250
1903.	4,734,913	1,094,998	5,829,911	8,592,829	102,434	.....	9,804	14,534,978
1904.	5,106,367	801,799	5,908,166	7,859,140	83,391	.....	9,190	13,859,887
1905.	7,815,728	1,155,648	8,971,376	10,941,375	102,233	.....	8,963	20,023,947
1906.	9,658,760	1,321,653	10,980,413	12,275,830	127,513	.....	14,380	23,398,136
1907.	10,279,315	1,270,421	11,549,736	11,667,549	131,234	.....	14,075	23,362,594
1908.	7,140,425	696,304	7,836,729	6,116,755	63,631	.....	6,132	14,023,247
1909.	13,417,472	1,076,464	14,493,936	9,330,783	107,355	13,762	9,185	23,955,021
1910.	15,292,329	1,212,180	16,504,509	9,412,772	122,303	52,141	3,194	26,094,919
1911.	14,685,932	912,718	15,598,650	7,947,854	97,653	29,105	2,844	23,676,106
1912.	19,041,502	1,139,221	20,780,723	10,327,901	121,517	18,309	2,853	31,251,303
1913.	20,344,626	1,255,305	21,599,931	9,545,706	121,226	30,180	3,831	31,300,874
1914.	16,271,129	903,555	17,174,684	6,220,846	89,869	24,009	3,622	23,513,030
1915.	22,308,725	1,370,377	23,679,102	8,287,213	113,782	69,412	1,527	32,151,036
1916.	29,616,658	1,798,760	31,415,427	11,059,039	129,692	168,918	604	42,773,680

PRODUCTION OF WROUGHT IRON AND STEEL PIPE AND BOILER TUBES, 1915–1916.

Kinds of pipe	1915—Gross tons.			1916—Gross tons.		
	Iron	Steel.	Total.	Iron.	Steel	Total
Black, standard...	112,470	711,297	823,767	110,694	1,021,949	1,132,643
Galvanized.....	27,702	253,242	280,944	28,540	262,473	291,013
Oil country goods.	39,753	563,167	602,920	85,805	854,686	940,491
O. D. and misc....	108	115,005	115,113	136	138,627	158,763
Boiler tubes.....	26,480	70,450	96,930	52,942	95,206	148,148
Total.....	206,513	1,713,161	1,919,674	278,117	2,372,941	2,651,058

PRODUCTION OF CAST IRON PIPE, NET TONS, 1915–1916.

Kinds of pipe.	1915—Net tons.			1916—Net tons.		
	Pipe.	Fittings	Total	Pipe	Fittings.	Total.
Gas and water*...	911,901	44,471	956,372	874,129	60,497	934,626
Soil and plumbers'	184,869	73,629	258,498	206,494	73,213	279,707
Total.....	1,096,770	118,100	1,214,870	1,080,623	133,770	1,214,333

*Includes culvert pipe. Manufacturers able to separate their production report 27,014 tons of culvert pipe in 1916 and 25,140 tons in 1915.

PRODUCTION OF MISCELLANEOUS ROLLED PRODUCTS, GROSS TONS, 1912–1916.

Products.	1912.	1913.	1914.	1915.	1916.
Hoops.....	270,007	280,886	211,028	281,759	368,164
Bands and cotton-ties.	587,395	499,660	345,919	437,987	173,311
Long angle splice bars, fish-plate bars, tie-plate bars, etc.....	571,772	686,390	423,052	535,615	691,820
Rolled sheet piling....	22,276	46,289	35,314	24,026	19,196
Railroad ties.....	41,396	44,244	33,249	42,269	34,311
Rolled forging blooms and forging billets...	462,476	537,210	331,524	650,545	2,015,960
Blooms, billets, sheet bars, tinplate bars, etc., for export.....	347,783	88,778	91,907	562,418	512,483
Spike and chain rods, bolt and nut rods, horseshoe bars, strips, shafting, tires, etc...	1,187,108	1,067,444	937,918	1,227,455	1,669,228
Total.....	3,490,213	3,250,901	2,409,911	3,762,074	5,484,473

PRODUCTION OF IRON AND STEEL TERNE PLATES AND STEEL TINPLATES, 1908–1916.

Years.	Terne plates—Pounds.			Steel tinplates.	Grand total. Pounds.
	Iron.	Steel.	Total.		
1908.....	6,560,500	147,618,500	154,179,000	1,048,896,000	1,203,075,000
1909.....	8,054,900	182,875,100	190,930,000	1,179,858,000	1,370,788,000
1910.....	5,765,000	162,419,000	168,184,000	1,450,821,000	1,619,005,000
1911.....	7,720,000	150,721,000	158,441,000	1,597,629,000	1,756,070,000
1912.....	11,259,000	180,137,000	191,396,000	1,965,659,000	2,157,055,000
1913.....	6,433,000	130,511,000	136,944,000	1,708,186,000*	1,845,130,000
1914.....	6,109,000	140,086,000	146,195,000	1,939,785,000	2,085,980,000
1915.....	4,653,860	158,816,786	163,470,646	2,201,825,054	2,365,295,700
1916.....	4,199,154	209,977,798	214,176,952	2,552,224,275†	2,766,401,227

* Includes about 1,000 pounds iron tinplates.
† Includes 208,000 pounds of iron tinplates.

PRODUCTION OF ALLOY STEEL INGOTS AND CASTINGS.

Years.	Ingots.	Castings	Total.	Years.	Ingots.	Castings	Total.
1909.....	158,978	23,002	181,980	1913....	625,430	88,927	714,357
1910.....	538,462	29,357	567,819	1914....	577,107	69,846	646,953
1911.....	425,169	56,290	481,459	1915....	923,251	97,896	1,021,147
1912.....	689,392	103,109	792,501	1916....	1,306,157	56,458	1,362,615

PRODUCTION OF SKELP, SHOWING IRON AND STEEL SKELP SEPARATELY, GROSS TONS, 1905–1916.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1905...	452,797	983,198	1,435,995	1911.	322,397	1,658,276	1,980,673
1906...	391,517	1,137,068	1,528,585	1912.	327,012	2,119,804	2,446,816
1907...	444,536	1,358,091	1,802,627	1913.	312,746	2,189,218	2,501,964
1908...	297,049	853,534	1,150,583	1914.	264,340	1,718,091	1,982,431
1909...	370,151	1,663,230	2,033,381	1915.	262,196	2,037,266	2,299,464
1910...	350,578	1,477,616	1,828,194	1916.	355,445	2,572,229	2,927,674

PRODUCTION OF CONCRETE BARS, SHOWING IRON AND STEEL CONCRETE BARS SEPARATELY, GROSS TONS, 1909–1916.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel	Total.
1909...	.....	159,352	159,352	1913.	113	319,557	319,670
1910..	4,645	236,464	241,109	1914.	.....	288,471	288,471
1911..	2,388	256,353	258,741	1915.	.....	353,408	353,408
1912...	2,500	271,832	274,332	1916.	2,683	458,717	461,400

PRODUCTION OF MERCHANT BARS, SHOWING IRON AND STEEL MERCHANT BARS SEPARATELY, GROSS TONS, 1905–1916.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1905...	1,322,439	2,271,162	3,593,601	1911.	835,625	2,211,737	3,047,362
1906...	1,481,348	2,510,852	3,992,200	1912.	944,790	2,752,324	3,697,114
1907...	1,440,356	2,530,632	3,970,988	1913.	1,026,632	2,930,977	3,957,609
1908...	685,233	1,301,405	1,986,638	1914.	563,171	1,960,460	2,523,631
1909...	952,230	2,311,301	3,263,531	1915.	657,107	3,474,135	4,131,242
1910...	1,074,163	2,711,568	3,785,731	1916.	993,948	5,625,598	6,619,546

Record Set

In Output of Ingots and Finished Products in 1916

Steel production in the United States in 1916 jumped ahead 10,622,644 gross tons and reached the tremendous total of 42,773,680 gross tons of ingots and castings, by far the largest in history, according to the statistics compiled by the American Iron and Steel Institute. The output of ingots was 41,401,917 gross tons, or almost double that of 1914 with 22,819,784 tons. The 1915 output was 31,284,212 gross tons. Production of steel castings during the past year was 1,371,763 gross tons compared with 866,824 gross tons in 1915; 693,246 gross tons in 1914; and 1,020,744 gross tons in 1913. In the 29,616,658 gross tons of basic open hearth steel ingots and castings produced in 1916 were included 3,436,457 gross tons of duplex steel ingots and castings against 1,781,491 gross tons in 1915, an increase of 92.9 per cent. Of the 1,362,615 gross tons of alloy steel produced, 932,548 gross tons were basic open hearth, 222,207 gross tons acid open hearth; 90,294 gross tons bessemer; 46,437 gross tons crucible; and 71,129 gross tons electric steel.

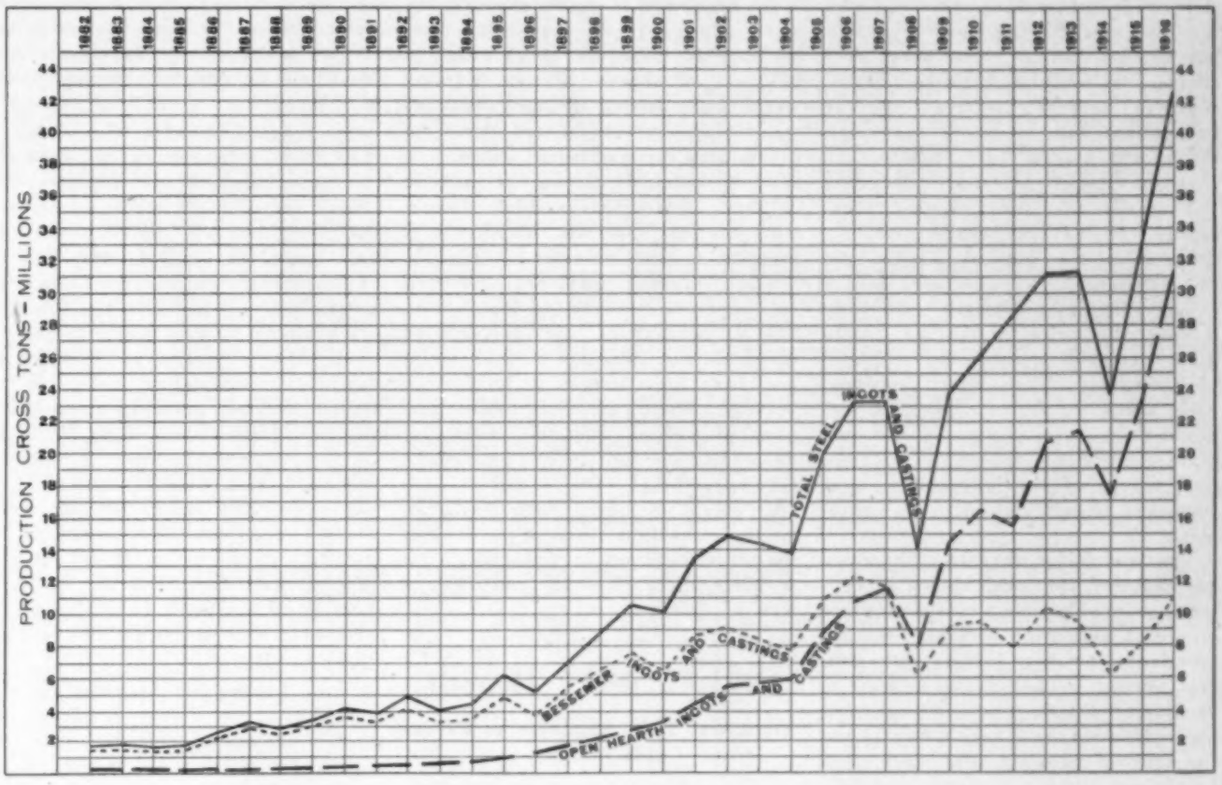
Rolled products of all kinds in 1916 expanded to 32,380,389 gross tons, an increase of 32.7 per cent over 1915. Of this output, 30,557,818 gross tons were steel and 1,822,571 gross tons were iron. Of the plates and sheets produced, 1,224,234 gross tons were universal plates; 1,982,863 gross tons were sheared plates rolled on single stands; 470,287 gross tons were sheared plates roughed and finished on separate stands; 2,249,597 gross tons were black sheets; and 1,526,999 gross tons were black plates. Of the black plates, 1,283,802 gross tons were for tinning purposes. The output of galvanized sheets was 738,613 net tons of which 673,462 were galvanized sheets proper and 65,151 galvanized formed products. The various works manufactured 17,147,665 100-pound kegs of wire nails against 14,583,026 kegs in 1915. Exports in 1916 were 3,363,876 kegs compared with 2,051,475 kegs in 1915. The 1916 production of iron and steel forgings was 923,767 gross tons against 523,723 gross tons in 1915 and of hammered charcoal iron, blooms, plates, etc., 80,685 gross tons in 1916 compared with 43,121 gross tons in 1915. Seamless tube output in 1916 was 190,473 gross tons against 139,668 gross tons in 1915.

In 1916, 109 works in the United States were making alloy steel and castings; 174 steel ingots; and 230 steel castings. There were 33 works making black plates for tinning; 35 tin plate and terne plate; 84 galvanized sheets and galvanized formed products; 45 iron and steel skelp; 5 iron or steel nail or spike plate; 26 iron and steel pipe and boiler tubes; 50 wire nails; and 72 cast iron pipe.

In Canada in 1916, the production of pig iron was 1,069,541 gross tons compared with 825,420 tons in 1915, and 705,972 gross tons in 1914. The previous record was set in 1913 with 1,015,118 gross tons. Of last year's total, 851,453 gross tons were basic; 181,748 tons were foundry; 12,575 tons were bessemer, all other grades totaling 23,765 tons. The charcoal iron production aggregated 41,011 gross tons.

The output of steel ingots and castings in 1916 was 1,286,509 gross tons against 912,755 tons in 1915; 743,352 gross tons in 1914, and 1,042,503 gross tons in 1913. Ingots accounted for 1,255,196 gross tons and castings 31,313 gross tons. Of the total, 1,245,488 gross tons were produced by the open hearth process; 10,968 tons by the bessemer process, and 30,053 tons by all other processes.

The production of finished rolled products was 963,801 tons. The output of rails was 81,497 tons; structural shapes and wire rods, 174,490 tons; plates and sheets, nail plate, merchant bars, tieplate bars, etc., 707,823 tons. The rail output showed a big decline from 1915 when the production was 209,752 tons, which year in turn showed a heavy loss from 1913 when 506,709 gross tons of rails were produced.



PRODUCTION OF STEEL INGOTS AND CASTINGS BY PROCESSES, 1882-1916

Iron and Steel Financial News

Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers

Why Steel Stocks Show Strength

ONCE more the steel stocks have come into their own. Wall Street seems at last to realize something which has been in the minds of members of the iron and steel trade for months—that some of the steel stocks which have been selling around par or less have been comparatively cheap. Current earnings in several instances are at the annual rate of more than half the recent market valuations of the common stocks of steel producers. For weeks the steel division stubbornly resisted the bearish tendency existing in the general market and this strength finally developed into a strong buying movement, gradually forcing the price of United States Steel common to the highest level of the year. Then, last Thursday, Steel common sold up to 131½ exceeding by nearly two points the highest price on record. The common shares of the independent steel companies likewise joined in the movement.

The reason for the strength which has featured the steel shares in contrast with the weakness in other securities, is almost obvious. Four restrictive factors have influenced the general market, namely: The submarine campaign; Russia's position; government taxation and requirements and the railroad situation. But steel stock enthusiasts have insisted that their favorites are not susceptible to these ominous signs. They point out that the submarine campaign is effecting the destruction of steel and creating a demand for steel for ship building purpose. They also assert that no matter what steps Russia may take, demand for steel will not be diminished, for in the remote possibility of Russia making a separate peace, the United States would play an even more active part in the war and the drain upon our steel resources would accordingly increase. As for government taxation, it is maintained that prices have gone up fast enough this year to account even for the excess profit and income taxes proposed in the house bill, while statisticians figure that not over 5 per cent of the annual production of steel will be required by the government this year. Finally, the railroad situation is not considered as vitally affecting the steel industry at this particular time, so long as there are freight cars to be had. A substantial rate increase would mean buying of equipment, but steel company books are filled to overflowing without such orders. In the long swing, of course, the problem of the railroads is everybody's problem, but just now the steel trade is standing on its own feet.

The foregoing may be considered an optimistic survey of conditions, but it summarizes the opinions of certain strong interests in Wall street who have been leaders in steel stock buying. There are unfavorable factors, of course, and the times undoubtedly are not propitious for a runaway market, even though ten bilions are to be spent here this year. At the same time there is no denying that the sentiment in financial circles is much more cheerful now than it was in recent weeks.

Sell Liberty Bonds

Employers Help Employes to Participate in Loan

In an effort to encourage the employes of the company to purchase Liberty Loan bonds, officials of the Central Steel Co. and its allied company, the Massillon Rolling Mill Co., both of Massillon, O., have decided to pay all of their employes who buy one or more bonds one-half of 1 per cent interest, thus giving the employe a 4 per cent return upon his money rather than the 3½ per cent which the bonds themselves pay. This action was thought advisable as the officials realized that some of the employes might hesitate to disturb their savings which are drawing 4 per cent on time deposits in the savings banks and accept only 3½ per cent on the new bonds. The cost of such action is largely nominal, as on a $100,000 loan any company following this plan would pay only $500. The directors of the company have just decided to take this action, but it is expected that a generous response will be made by the employes of the firm. The Central Steel Co. itself has purchased $50,000 worth of the bonds and the Massillon Rolling Mill Co. has taken $25,000 worth.

The General Electric Co., Schenectady, N. Y., has set aside $5,000,000 for the purchase of Liberty loan bonds. In addition to this investment, the company will purchase Liberty loan bonds for its 79,000 employes on subscriptions, in all denominations, to any amount, and give the subscribers extended time in which to pay for them. The company will pay for its employes' subscription bonds as required by the government and will permit the subscribers to pay for them on the installment plan as follows: $50 bond, $1 per week; $100 bond, $2 per week; $500 bond, $10 per week; $1,000 bond, $20 per week, or by monthly payments of 10 per cent of subscription each month. A large number of employes have already expressed a willingness to subscribe for these bonds.

The Lakewood Engineering Co., through C. F. Lang, president, recently announced that the time was fitting for every man in the organization to show his patriotism by buying a Liberty bond. The Lakewood company has decided to buy the bonds and sell them to the employes on the basis of a small weekly payment. The company will itself pay $2 on every $50 bond purchased. For instance, if an employe wishes to buy a $50 bond, he will make 24 weekly payments at $2 each, the company making the twenty-fifth payment of $2. In this manner a $50 bond will cost an employe but $48 and he will receive in addition the interest on the bond which amounts to $1.75, making the net cost to him $46.25. Employes wishing to purchase bonds outright in one payment will pay $48 down and the company will pay the balance of $2.

Nation's Chiefs Outline War Plans

Members of Cabinet, Council of National Defense, Food Administrator Hoover, Frank A. Vanderlip, and Others Tell Editors of Business Papers What Country Must Do to Win War

THAT every department of our government is alive with electric energy in making preparations for the conduct of the war with Germany, was impressed upon the editors of trade and technical business papers of the country who attended a conference at Washington, Friday, May 25, at the New Willard Hotel. This meeting was held "to promote the more effective use of the business energies of the country by a closer co-operation of the business press with the government". The editors were addressed by members of the cabinet, council of national defense, and others.

Frank A. Vanderlip, president of the National City bank, New York City, predicted that we are about to see the greatest industrial activity this country has ever known. It will include the highest wage scales ever paid and the employment of two men in place of one today. "The government is organizing for a new business", said Mr. Vanderlip. "The business of war no longer is that solely of fighting, but all are combatants, all are in the fight. Our success will be measured by the degree of our organization.

"The government asks for $7,000,000,000; nobody knows what that means. We haven't that much money, and if we haven't got it, where are we to get it? We must get it from the wealth of the country which is estimated at $250,000,000,000. But we can't subscribe railways and houses and business. All that our forefathers or ourselves have saved, is in property and you can't invest money over again.

"This war must be fought on the savings of the future. The whole answer is in the expansion of banking credits. We must borrow in advance of our savings and liquidate as we go. This applies to all, millionaire and employe alike.

"In a way, our job is more difficult than Great Britain's. The British had $1,500,000,000 loaned out on foreign bills, but we have no foreign resources and we must borrow to pay. This teaches thrift. We are a nation of spenders and we must learn to economize. We should interest millions of persons and if we succeed in teaching them thrift, we will have opened resources equal annually to the amount of this bond issue.

"Some think economy will be bad for business, but no, business will be different. It will be a business of necessities. We cannot give the government $7,000,000,000 and expect to have as much left to spend as at present. It is unpatriotic to spend money for anything but necessities now.

"We must have the power of accumulation to fight this war successfully. I believe business men possess the patriotic desire to pay wise taxes, but it is not wise to levy a discouraging tax and we must have prosperity to win. We must not put the whole burden of this war on the present generation at the beginning of the war.

"Many wonderful by-products will come out of the war for us. Our people will learn thrift and we will learn that we are fighting for democracy."

Franklin K. Lane, secretary of the interior, stated that "Germany represents feudalism plus science, and the United States represents democracy plus science." He pointed out that both are as irreconcilable as slavery was in the South and freedom in the North. Referring to Germany again, he said that "this country represents the feudalism of the thirteenth century and the inventive genius and progress of the nineteenth century."

"That the diplomacy of central Europe for 25 years has been based upon industrial supremacy", was the statement of Newton D. Baker, secretary of war. He stated that Germany was so obsessed with a desire for industrial supremacy that the moral standard has been lost sight of entirely. He stated that the war was costing $60,000,000 per day, and perhaps as high as $100,000,000 was being expended, in addition to 10,000 lives, and every day that the war continues, the world is that much poorer.

Secretary of the Navy, Josephus Daniels, said that the first need of the navy is men, and second, ships. "Congress," he stated, "already has been asked for authority to commandeer ships, 75 per cent of the value of which is to be paid immediately in cash, and the difference between the values set by the owner and the government, in the case of no amicable agreement being possible, is to be adjusted by the courts." Secretary Daniels said, "that it would be a crime for men to make more than a normal profit out of this war." "I have a faith and a hope," he continued, "that we will overcome the submarine menace soon. We will have to follow Farragut's method and 'Damn the torpedoes, go ahead'."

"I hope none thinks that this war is going to be short, cheap or bloodless," said W. S. Redfield, secretary of commerce. "This is a serious job, we may require 2,000,000 men before we are through with it, but we are going to clean it up." Secretary Redfield briefly referred to the co-operation of the bureau of standards, which has solved the problem of the manufacture of optical glass that heretofore has been manufactured solely by the Germans.

Frank Scott, chairman of the munitions board of the council of national defense, explained the work of this board in great detail. He pointed out that war is the most complex of the sciences, in which is required men, metals, machinery and money. He contrasted the needs of this war with those of the Civil War and he stated that in the battle of Gettysburg, only 310 guns were used, which fired 32,726 rounds of ammunition. The same guns today can fire this same amount of ammunition in 10 minutes. Sherman, in his memorable march to the sea, had only 60 guns and 200 rounds of ammunition per gun. This lasted him from October to January. Under present war conditions, however, this ammunition would have lasted 10 minutes. Three-inch guns today fire from 20 to 26 shots per minute. The needs of this war as reflected by the expenditure of ammunition, were contrasted with the Civil War, and the requirements of every department are multiplied in the same proportion. In pointing out the tremendous army of men that must be maintained at the back of the line to support those at the front, he cited the finishing of a shrapnel forging which requires no less than 53 machine tool operations before it is filled.

The pooling arrangement entered into among shippers of coal to the northwest, was referred to by Francis S. Peabody, chairman of the committee on coal production, of the council of national defense. He said that as a result of this arrangement, coal shipments to the northwest will be increased 3,000,000 tons during the season of navigation and that shipments of ore to lower lake ports will be increased the same amount. The pooling of floating equipment in the east to increase coal shipments to New England points a total of 5,000,000 tons, now is under active consideration.

Munitions Men to Pool Experience

Discussion of Munitions Problems by Mechanical Engineers and Tool Builders at Cincinnati Results in Recommendation to Eliminate Trade Secrets and to Exchange Information for Common Good

IN WHAT was perhaps the most representative assembly of munitions manufacturers ever held in the United States, members and guests of the American Society of Mechanical Engineers and National Machine Tool Builders Association, devoted Wednesday and Thursday, May 23 and 24, of the spring meeting at the Hotel Sinton, Cincinnati, to a thorough discussion of munitions problems. It developed that the greatest obstacle now confronting American manufacturers is the inability to secure the information required for operating a munitions plant. Munitions manufacturers have maintained the policy of secrecy and have not allowed trade secrets to escape from within the confines of their own plants.

In the first munitions session, held Thursday morning, the contrast between American practice and that of awakened Canada, was carefully drawn by Reuben Hill, Canadian-Detroit Lubricator Co., who stated that soon after the war began, Canadian manufacturers discovered that complications were preventing them from rendering full service to their country. They found it necessary to discard trade secrets and to open their plants to each other, there being a complete interchange of experience. This permitted the small manufacturer to profit by the experience of the larger and older manufacturers, and in this way duplication of experimental effort was eliminated. Mr. Hill strongly urged that the manufacturers in the United States adopt a similar policy. He also appealed for a more conscientious effort of engineers to making munitions. He declared that in one day on the British front 14 guns exploded, in each case the entire gun crews being killed, because of defective time fuses made in America. He also emphasized the need of master gages and adequate provision for intelligent construction which would prevent disasters of the kind cited.

The discussion in the first munitions session followed the presentation of papers by Frederick A. Waldron, industrial engineer, New York; Arthur L. Humphrey, vice president Westinghouse Air Brake Co., Wilmerding, Pa.; and Harry L. Coe, vice president Harpham, Barnes, Stevenson & Coe, Inc., Boston. Mr. Waldron took up the subject of financing munitions plants and showed that improper methods of handling the finances had caused a number of large manufacturing plants to fail in their efforts to make munitions. He made a statement if a plant was run honestly and no effort was made to beat the foreign governments or the United States government, the company would have no trouble in obtaining adequate compensation for the work performed. Mr. Coe said that the internal mechanism of a munitions organization consisted of a general service department, a diplomatic staff, a production department and an inspection department. He laid especial stress on the importance of the diplomatic staff, saying that in a well-organized diplomatic staff, the points of contact between the foreign inspectors and the representatives of the munitions plants are limited, and this encourages a better understanding. The papers presented by Messrs. Waldron, Humphrey and Coe, appear on pages 1129, 1125 and 1126, respectively, in the May 24 issue of *The Iron Trade Review*.

In the discussion which followed, a number of manufacturers of munitions emphasized the importance of welfare work and one speaker related the experience of a company in which the sales engineering staff had been utilized as a diplomatic staff of the munitions department. Reuben Hill then brought up the subject of co-operation, stating that the maximum production of munitions from the vast resources of the United States can never be attained until co-operation comes to the fore, and competition is pushed into the background. He told about the manner in which information and experience is freely exchanged in Canada. Lieutenant Commander R. R. Adams, ordnance department, United States Navy, addressed the members and guests of the two organizations and outlined the policy of the navy department regarding munitions. At the conclusion of his remarks, Mr. Adams was asked a number of questions regarding what the navy department can do in the way of furnishing information on the manufacture of munitions. The gage problem was also brought up, and it developed that although 40,000,000 screws are manufactured in the United States every day, there is not a place in the country where the threads of these screws may be tested. James Hartness, president Jones-Lamson Machine Co., Springfield, Vt., emphasized the need of publicity to enable all manufacturers of munitions to receive proper information regarding the latest developments in munitions making. Frank C. Gilbreth, president Frank C. Gilbreth, Inc., New York, voiced the opinion that the country is spending too much of its time and attention on materials and tools, where, in his opinion, attention should be focused on the human element, there being a greater opportunity for additional economy and efficiency in this line than in any other. A number of speakers, including Lieutenant Commander Adams, Dr. Wm. Kest, Harry L. Coe and Reuben Hill, discussed various phases of the problem of perfecting co-operation between munitions manufacturers. The elimination of trade secrets, suppressing of competition, greater publicity, a removal of the lid on information pertaining to munitions making, and the inauguration of a system whereby the best men from a munitions plant can visit other shops to gain and to give information were some of the suggestions offered.

Harry E. Harris, president of the H. E. Harris Engineering Co., Bridgeport, Ct., told how the boards of trade and other similar organizations in Clearfield county, Ct., had joined forces and organized for closer co-

1917 Spring Meeting Most Successful

Men who have held the opinion that meetings of national technical and engineering societies should be postponed until after the war is over, are undoubtedly surprised to learn that the 1917 *spring meeting of the A. S. M. E. was the most successful in attendance and interest displayed in the history of the organization. The attendance of members at spring meetings has been:*

Cleveland, 1912	221
Baltimore, 1913	142
St. Paul, 1914	200
Buffalo, 1915	223
New Orleans, 1916	114
Cincinnati, 1917	400

This showing is attributed to the fact that the program included papers dealing with problems imposed by the war on engineers and manufacturers. The meeting therefore rendered a patriotic service to the nation.

operation. The organization included five departments as follows: Military, transportation, industrial, marine and welfare, and agriculture. The industrial department is divided into 10 other divisions, one of which is a committee in charge of the interchange of measuring instruments and the offering of the services of expert gage manufacturers. Mr. Harris complimented the organization's work.

Dr. Ira N. Hollis brought the discussion to a close when he said that the obvious duty of the American Society of Mechanical Engineers was to take some definite action which would place the society on record as favoring the establishment of a central bureau of information for munitions manufacture. A committee was appointed to draw up resolutions covering this plan.

Information for Munition Makers

On account of the unusual amount of discussion provoked by the papers read at the morning session, the first munitions session, was adjourned at 1 p. m., to be continued at 2:30 p. m. the same day. In the afternoon session, H. V. Haight, chief engineer of the Canadian Ingersoll-Rand Co., Ltd., Sherbrooke, Quebec, presented a paper on procuring special machines for munitions manufacture. Lucien I. Yeomans, industrial engineer, Chicago, presented a paper dealing with the practical methods of making shells in wartime emergency. Several speakers, in discussing the subject introduced by Mr. Yeomans, expressed the opinion that there will be no need for the mushroom growth outlined by the author of the paper. W. H. Carrier, chief engineer, Buffalo Forge Co., Buffalo, N. Y., and Frederick A. Waldron, industrial engineer, New York, again brought up the subject of providing a central bureau of information for munitions manufacturers. It was suggested that a hand book containing this information be published and L. P. Alford, former editor of the *American Machinist,* was asked if he thought this plan was advisable. Mr. Alford stated that a great deal of documentary information published in various forms in the United States and Canada could easily be assembled in a single volume and would be of considerable value to munitions makers. Fred E. Rogers, editor of *Machinery,* remarked that the hand book proposed involved considerable work and he warned the members of the American Society of Mechanical Engineers against undertaking a problem of this magnitude without first carefully considering it.

A lively discussion of resolutions occupied the entire morning session, Thursday. Luther D. Burlingame, industrial superintendent, Brown & Sharpe Mfg. Co., Providence, R. I., chairman of the committee on resolutions, stated that the committee submitted a resolution to the effect that "Be it resolved that the American Society of Mechanical Engineers urge immediate action on the part of Congress * * * * * * in the adoption of standard gages, and equipment for the manufacture of munitions." It was also "Resolved that an appeal be addressed to the manufacturers and engineers of this country providing for the interchange of ideas and plant system * * * * * * and the dissemination of knowledge commonly known as shop secrets so far as it pertained to the manufacture of munitions." A third resolution urged that "the government indicate by badge or uniform the employes of munition plants and similar government properties which are essential in the time of war." These resolutions were passed unanimously and submitted to the council for further consideration.

Frederick A. Waldron, industrial engineer, New York, submitted a resolution urging that the American Society of Mechanical Engineers appoint a council to act as a clearing house for the distribution of information with regard to the manufacture of munitions and properties of war and that $30,000 be appropriated for furthering the work of the council. The resolution was referred to the council.

Dr. Ira N. Hollis presided at the opening of the morning session and after the final discussion on the resolutions which were presented for consideration, called upon Major Bond, United States engineers corps, Cleveland. Major P. S. Bond scouted the idea that slackers would exist after June 5. "Registration day," said Major Bond in discussing the point, "automatically eliminates the slacker question. It is not a case of whether you want to volunteer or not, it is the law that you must register. Whether you are in active service at the front or hoeing a row of onions in a 2-acre patch is left to the judgment of the exemption committees. One is as patriotic a duty as the other. Let me urge upon you men who are doing big things in these big times to stick to your knitting. Let the munition manufacturers go about their business in a safe and sane manner; do not forget that the man building reapers and farm tractors had far better keep his plant busy doing that one thing well, than to attempt to make shrapnel or high-explosive shells. Enthusiasm is the keynote of success. Yet enthusiasm must be tempered with judicious application. Therefore I urge you, stay at your job of doing what you can best do."

Goethals Honored

As is the custom each year in the American Society of Mechanical Engineers to elect one honorary member to the society, Dr. Hollis announced that by unanimous vote, George W. Goethals had been selected. The announcement was enthusiastically received and the prolonged applause clearly indicated that the choice was a popular one.

Owing to the lack of time, the papers scheduled for presentation Thursday morning were not read.

The meeting was brought to a close by Dr. Hollis, who urged that the remarks made by Major Bond be closely borne in mind. "The educational systems," said Dr. Hollis, "have just as important parts now as the munition factories. They are responsible for the education of our young engineers, a highly important function, and they should by all means be awake to the seriousness and gravity of the task before them."

No pains were spared by the Cincinnati chapter of the A. S. M. E. to provide an interesting series of entertainments for the visiting members and the ladies. Boat rides, automobile trips to places of interest, including some of Cincinnati's finest industrial plants, a smoker for the gentlemen and dancing made up the program. The smoker was enthusiastically received. Prominent characters in the National Machine Tool Builders' Association and the A. S. M. E. were burlesqued by local talent and a mock trial of a well-known tool builder contributed to the success of the smoker.

Business Triumphs Over Pleasure

The reading of three papers dealing with munitions problems Wednesday morning, was followed by a general discussion, which lasted until one o'clock. At that time, Dr. Hollis, as chairman of the meeting, asked if the members desired to have the discussion continued Thursday morning at the next scheduled session. Despite the fact that a boat ride on the Ohio river had been planned for the afternoon, a motion was made, seconded and unanimously carried to continue the discussion at 2:30 that afternoon. It thus developed that although a number of the members and guests and most of the ladies enjoyed the river trip, practically all of the men associated with munitions manufacture attended the continued meeting. It is thought that this is an example of devotion to business rarely witnessed in assemblies of engineers and manufacturers.

Ship Yards Still Heavy Buyers

Many New Companies Besiege Tool Builders and Dealers for Equipment—Deliveries on Munition Making Machines Are in Turmoil—Railoads Active in Chicago Market—Cranes Are Purchased Liberally

ONE of the most encouraging signs in the machine tool situation is the gradual disappearance of hysteria and the settling down of government authorities and machinery builders and users to a common-sense basis. It is not meant by this statement that all confusion has ended or that negotiations have been reduced to a systematic order. But it is becoming generally realized among those principally concerned that there may be a shortage in the capacity to meet emergency demands of the government. The plants of some builders of heavy equipment are from 75 to 90 per cent engaged, directly or indirectly, in government work and will be so taken up for many months, so that preferred deliveries on certain orders mean deferred deliveries on other government orders. However, the authorities at Washington are beginning to understand conditions, as well as the big munition companies and others for whom equipment is being made. Further orders are being distributed for 3 and 4-inch field guns with manufacturers which are now trying to obtain rifling machinery and other tools. Reports from Washington indicate that orders soon will be placed for enormous lathes capable of turning 20-inch guns, although it is understood the plan now is to turn 18-inch guns, for coast defense work.

Negotiations by ship builders continue a feature of the machinery market. Numerous new companies have sprung up since this country entered the war and some machinery builders draw a comparison between their figuring in the market with similar figuring during the war order fever early in 1915. Some of these new companies, of course, have sound backing and good prospects. Others, however, not only do not own a yard but not even a site. Practically all are after government orders and are figuring tentatively for equipment. Established yards continue among the most important factors in the machinery market, most of them buying tools and cranes from time to time, so that in the aggregate their buying is heavy. The Newport News Ship Building & Dry Dock Co., Newport News, Va., has closed for a 72-inch open side planer through Manning, Maxwell & Moore. Newport News also has been buying some small and medium sized engine lathes from time to time. The Baltimore Dry Dock & Ship Building Co., Baltimore, has not yet closed for the 21 cranes for which it recently inquired, nor has it formally entered the market for other equipment, but its plans are progressing.

Crane builders report a large miscellaneous inquiry. The Chile Exploration Co. is inquiring for one 75-ton and one 10-ton electric traveling cranes, through the purchasing department of the American Smelting & Refining Co., at 120 Broadway, New York. A Cleveland builder has taken an order for two 15-ton cranes for Cuba. Westinghouse-Church-Kerr & Co. have placed an order for one 10-ton crane, 70-foot span, for the Driggs-Seabury Ordnance Co., Sharon, Pa. The Atlantic Gulf & Pacific Co., Brooklyn, N. Y., has closed for one 5-ton electric traveling crane.

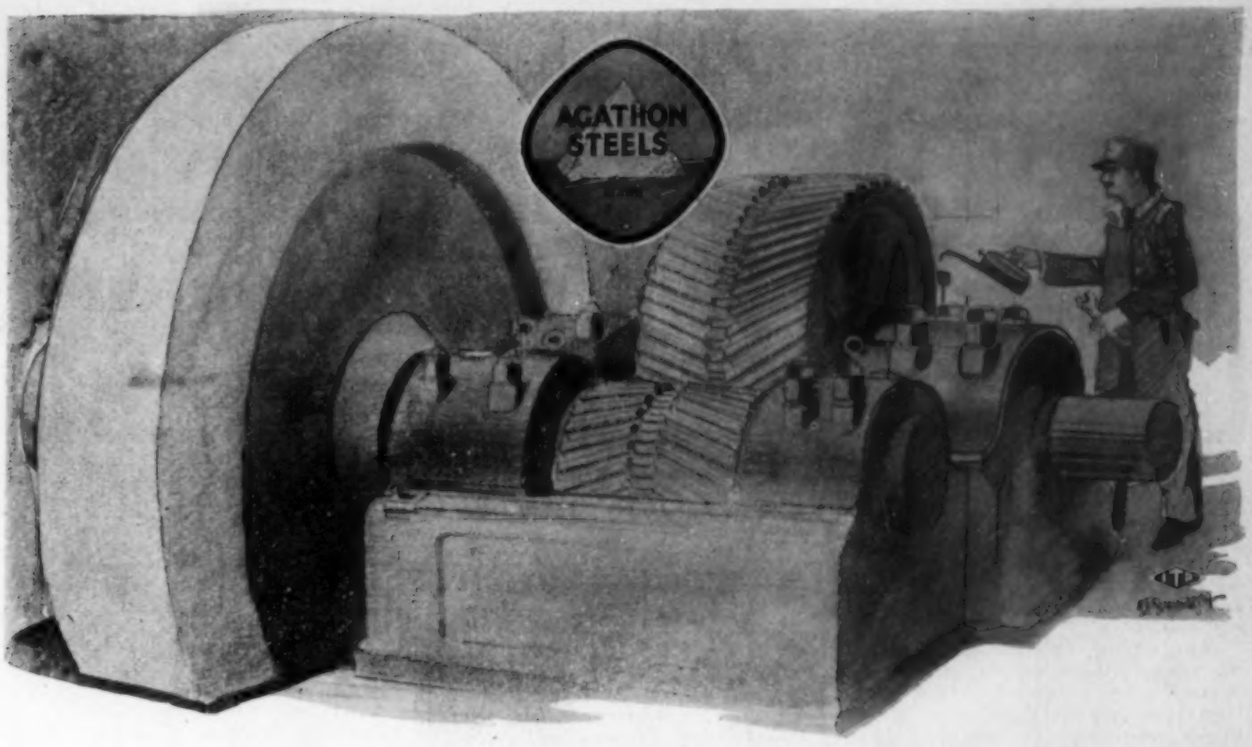
Railroads Enter Chicago Market

MACHINE tool dealers in Chicago find a slight slackening in demand, although the volume of business has been large. Some dealers find that a new record has been established during May. Indications lead many to believe that large buying for government purposes will be started shortly. Automobile manufacturers are running on a slower schedule and are not buying shop equipment to the usual extent. This is the only definite indication of lessening business which can be pointed out. Inquiry by the government for over 70,000 trucks and passenger automobiles probably will assist in renewing activity among automobile builders.

An inquiry creating some interest has been put out by the quartermaster's department at Chicago for 20 truck bodies and machine shop equipment, on which bids will be opened June 14. This inquiry is for traveling machine shops to accompany the army and provide means for quick repair on artillery or truck machinery. The equipment is to be similar to that furnished some months ago for service on the Mexican border. The Santa Fe railroad is reviving its inquiry on a number of tools which were not bought at the time its former list was before the trade. Included in the present inquiry are three 12-inch lathes, one 18-inch lathe, one 36-inch lathe, one 4½-foot and one 5-foot radial drill and wood working machinery. The Illinois Central railroad has inquired for a large number of tools for its various shops. An inquiry is current in this market for 25 lathes to produce 3-inch shells. The Chicago & Northwestern railroad is preparing to build several additions to its boiler shops in Chicago. The Wald Mfg. Co., Sheboygan, Wis., is building an addition. The Harris Knife Co., Albert Lea, Minn., is about to build a factory. The Pacific Electric Co., Torrance, Cal., is planning to erect a large plant. The Melba Co., Chicago, will build a power house. The Sioux City Service Co., Sioux City, Ia., will build a power house and sub-stations this year at an expenditure of $750,000. The city of Milbank, South Dakota, is about to make waterworks improvements including a centrifugal pump. The town of Kendallville, Ind., is planning to install three turbines at its waterworks, and Casey, Ill., will make waterworks improvements, including new pumps, according to an announcement.

Cleveland Business Steady

CLEVELAND machine tool dealers are optimistic, but not excessively busy. A good demand continues to enter the local market, but few large lists have appeared in the last two weeks. Some automobile plants are making additions to their machine shop equipment, but in nearly all cases the buying has been done quietly. Government agents have quietly, but thoroughly, canvassed the local dealers and builders and it is stated by some interests that this action may be a forerunner of heavy buying on the part of the federal government from dealers who have stock on the display floors. No authentic in-



STEEL FOR GEARS

A broken gear means disabled machinery: it means an expensive delay. Therefore the shop-owner, the mill-owner, the auto-truck owner, and in fact ***everybody*** who is an owner of ***anything*** of gear construction, should insist upon gears made of AGATHON STEEL.

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DETROIT OFFICE—326-27-28 Ford Building.
F. Walter Guibert, District Representative
CLEVELAND OFFICE—Hickox Building. The Hamill-Hickox Co., District Representative
CHICAGO OFFICE—Room 1370 Peoples Gas Bldg.
122 South Michigan Blvd., Mr. A. Schaeffer, District Representative
PHILADELPHIA OFFICE:—902 Widener Bldg.
Frank Wallace, District Representative

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"AGATHON" Vanadium
"AGATHON" Chrome Steel
"AGATHON" High Carbon

formation could be obtained on this point, but it is believed by many that when the general buying movement on the part of the government starts, dealers having a representative stock of tools on the floor will be asked to submit prices. Plain milling machines, cylindrical grinders and radial drills are being inquired for and the usual standing inquiry for boring mills represents the trend of the market. Lathes, usually in good demand, are not so popular, and deliveries on this type of equipment are excellent in most cases. There have been no price advances. The Cowles Tool Co., 410 Standard theater building, Cleveland, is in the market for one No. 1½ universal, heavy-duty miller and one No. 2 universal heavy-duty miller.

New Construction and Equipment

Concise and Timely Business Building Opportunities from the Field of Industry

Among New England Factories

AUBURN, ME.—The Roak Block, one of the largest brick buildings in Auburn, was damaged by fire recently. A loss of $50,000 was incurred.

BURLINGTON, VT.—The machine shop of the Vermont Construction Co. recently was damaged by fire to the extent of $5,000.

BOSTON.—The Dorchester Trust Co. has let the contract for a 1-story, 60 x 80-foot building to cost $100,000.

BOSTON.—Fire in the building at 189-191 High street, occupied by several machine companies, did $55,000 damage.

BOSTON. — The Atlantic Maritime Ship Building & Navigation Co. has been incorporated with $500,000 capital, by George S. McLaughlin, John T. Philbin, Somerville, Mass., and Charles G. Barry.

BOSTON.—The Kim Distributing Co. has been incorporated to make shock absorbers for motor vehicles, with $50,000 capital, by Benjamin K. Hall, Robert M. Clark, Newton Centre, Mass., and A. F. Brewer.

ERVING, MASS.—The plant of the Washburn-Heywood Chair Co., was damaged by fire recently, causing $100,000 loss. The plant will probably be rebuilt.

GARDNER, MASS.—The Heywood Brothers & Wakefield Co., will build a 1-story, 100 x 192-foot storage building, also coal pockets and an elevator at its plant.

KINGSTON, MASS.—The tack and rivet department of Cobb & Drew recently was badly damaged by fire.

MIDDLEBORO, MASS. — The Colonial Brass Co. has let the general contract for a 1-story plant addition, 30 x 60 feet, to George W. Starbuck.

SOUTHBRIDGE, MASS. — The Hamilton Woolen Co. will build a boiler house, 35 x 49 feet, to cost $10,000.

Government Inquiries

The Navy department, bureau of Supplies and Accounts will receive bids on the following equipment:

Three jib cranes, 3 to 5 tons capacity, self supporting, 1163, June 5, Philadelphia.
Three crane trucks, 2-ton battery, 1168, June 5, Washington, D. C.
Two hollow hexagon, universal turret lathes, 1167, June 5, Boston.
One motor-driven gear hobber, 1167, June 5, Boston.
One plate bending and flanging machine, 1166, June 5, Philadelphia.
One vertical spindle universal boring mill, 1169, June 5, Washington, D. C.
One vertical, hollow chisel mortiser, 1169, June 5, Washington, D. C
One 800-ton high-speed forging press, 1165, June 5, Norfolk, Va.
Two 150-ton hydraulic forging presses, 1165, June 5, Norfolk, Va.
Four bench type wood trimmers, 1169, June 5, Washington, D. C.

Schedule numbers and place of delivery follow the specifications of the tools. Further information may be had on application from the Navy Department, Bureau of Supplies and Accounts.

BRIDGEPORT, CONN. — The Bridgeport Gun Tool Co. has been incorporated with $25,000 capital by Fred E. Lacey, Stratford, Conn., William B. Boardman and G. L. Watt.

HARTFORD, CONN. — Plans are being drawn for a fireproof, 10-story, 160 x 170-foot building for G. Fox & Co., to replace that destroyed by fire recently.

HARTFORD, CONN.—Two warehouses of the Loydon, Northam & Loydon Co. on Windsor street, have been damaged by fire, with a loss of about $100,000.

MIDDLETOWN, CONN. — The Middlesex Machine Co. recently has been incorporated with $13,900 capital by Oscar W. Nilson, F. A. Brassill, William C. Adams and C. L. Goodrich, Hartford.

NEW BRITAIN, CONN.—Fire ruined a group of buildings known as Corbin Annex of the American Hardware Corporation. A loss of $75,000 was entailed.

NEW LONDON, CONN. — The Berlin Construction Co. has been awarded the contract to erect a 1-story, 110 x 125-foot addition as a forge shop for the New London Ship & Engine Co. in Groton.

NORWALK, CONN.—Bids have closed for a brick, 5-story, 90 x 250-foot addition to the factory of the Norwalk Tire & Rubber Co.

STRATFORD, CONN.—Plans will be ready soon for a brick, 1-story, 132 x 360-foot plant for the Spring-Perch Co., maker of springs, Bridgeport, Conn.

WINDHAM, CONN.—The Hosmer Mountain Feldspar Co. has been incorporated with $25,000 capital by William P. Jordan, Lyla Jean Deppeler and F. H. Deppeler, all of Willimantic, Conn.

Along the Middle Atlantic Seaboard

ALBANY, N. Y.—Fire recently damaged the plant of Rathbone Sard & Co., stove manufacturers.

AMSTERDAM, N. Y.—The Kaiser-Boswell Co. has been chartered with $35,000 capital, to engage in sheet metal roofing business, by Jacob H. Kaiser, Harry Boswell and David Kaiser.

BROOKLYN.—The Magna Machine Co. has been organized with $100,000 capital, by C. F. Splitdorf, G. H. Murphy and H. Newmann, 855 Driggs avenue.

COHOES, N. Y.—The W. T. Snyder Mfg. Co. has been damaged by fire and a loss of $50,000 entailed.

HORNELL, N. Y.—The National Sulphur Co. has been incorporated with $900,000 capital, to manufacture sulphur and chemicals, by C. B. Zabriskie, H. L. St. John and A. E. Beggs, 876 Caroll street, Brooklyn.

LOCKPORT, N. Y.—The Harrison Radiator Corporation recently has let a contract to the American Concrete Steel Co., Newark, N. J., for an office building.

NEW YORK.—The Manhattan Brass Co. has let a general contract to the Charles A. Cowen Co., 30 East Forty-second street, for a 7-story building.

NEW YORK.—The Baxter Shipyard Co. has been chartered with $90,000 capital, by G. S. Baxter, G. S. Baxter Jr., and W. Ferguson Jr., Stamford, Conn.

NEW YORK.—Cutting & Washington, Inc., has been organized with $110,000 capital, to manufacture machinery, etc., by R., F., and B. Cutting, 2 Nassau street.

NEW YORK.—B. Brown & Bro., Inc., capital $100,000, have been organized to make chemicals, etc., by J. C. Brown, D. R. Bernstein and I. Skutch, 998 Sterling Place, Brooklyn.

NEW YORK.—The Constable Tire & Rubber Co. has been incorporated with $100,000 capital, by G. J. Constable, R. S. Hoffman and H. P. Ressprich, 256 Seventy-ninth street, Brooklyn.

NEW YORK.—The Laurence Belting Co. has been chartered with $100,000 capital, to

Iron Ore

Physical Structure Coarse
High in Manganese
Very Desirable for Making Basic Iron

Crawford Ore is in demand because its coarse structure insures its working well in the furnace mixture.

From Our Open Pit Mines

CRAWFORD ORE
Mesaba Non-Bessemer

Ask the successful furnace manager to what he attributes his achievement. He won't tell you that it is GOOD LUCK—for it ISN'T. He'll tell you that behind his success lies CRAWFORD ORE. Are YOU using it?

The Tod-Stambaugh Company
Perry-Payne Building Cleveland, Ohio

Say you saw it in THE IRON TRADE REVIEW

manufacture leather belting, by A. C. Laurence, P. S. Suffern and A. O'Brien, 2311 Grand avenue.

NEW YORK.—The Winett Operating Co., capitalized at $150,000, will manufacture machinery of all kinds. J. A. Reilly, M. I. Buchanan and L. Hartman, 75 West Eighty-ninth street, are the incorporators.

NIAGARA FALLS, N. Y.—Fire recently damaged the chloro-benzol plant of the Electro-Chemical Co. to the extent of $200,000.

ROCHESTER, N. Y. — The Hauser Machine & Mfg. Co., capital $50,000, will manufacture machinery. J. Hauser, W. E. Hauser and G. J. Dash are the incorporators.

SARANAC LAKE, N. Y. — The Palmer-Simpson Corporation, chartered with $10,000 capital, by C. S. Palmer, D. S. Simpson and M. J. Corey, will make hydroplanes, launches, etc.

SYRACUSE, N. Y.—The Syracuse Northern Electric Railway Co. has been chartered with $1,250,000 capital, by C. L. Allen, T. C. Cherry and A. H. Cowie.

TROY, N. Y.—The Moline Seal Lock Co. has been organized with $25,000 capital, to manufacture locks and metal seals, by C. F. Jordan, T. P. Huxtable and C. S. Brintnall.

YONKERS, N. Y.—The Stevens Industrial Corporation, capital $1,500,000, will engage in manufacturing. The incorporators are: W. R. Phelps, E. G. Gilman and G. C. Stevens.

ALLENTOWN, PA.—James K. Bowen has let a general contract to W. H. Gangewere & Co., for a $20,000 factory building, 25 x 100 feet, four stories high.

PHILADELPHIA. — American Pulley Co. will erect a 2-story plant addition, 50 x 70 feet.

Activities in the Central States

ALGOMA, WIS.—A foundry addition, 30 x 50 feet, is being erected by the Plumbers' Woodwork Co. at Algoma. Several new molding machines and a new brass melting furnace are being installed.

CLINTONVILLE, WIS.—Plans are being made to build the first unit of the Four Wheel Tractor Co., Antigo, Wis. An architect will be selected at once. A brick and concrete building, 100 x 125 feet, 1-story, with sawtooth roof is proposed. A. B. Mayhew, Clintonville, is secretary.

De PERE, WIS.—Extensive improvements in the plant of the Western Steel & Iron Works, De Pere, have been completed and the office building is now being rebuilt and enlarged.

EAST MILWAUKEE, WIS.—At a special election it was voted to install a municipal street lighting system of 300 electric arcs at an estimated cost of $25,000. Ernst Briesen is village president.

ELKHORN, WIS.—Bonnett & Co., Milwaukee, have been awarded the general contract to erect a 2-story factory, 65 x 250 feet, to be built by the Elkhorn Factory Co. for the use of Frank Holton & Co., Chicago.

MILWAUKEE.—Paul Riesen & Sons, have been awarded the general contract to erect the first unit, costing $250,000 of the new $750,000 Columbia Hospital it will be 40 x 136 feet, with wings, 43 x 61 feet and 40 x 75 feet, and will have four stories.

MILWAUKEE. — The Richardson-Phoenix Co., C. M. Rogers, president, soon will commence work on a $30,000 plant addition, 100 x 140 feet.

MILWAUKEE.—The Keystone Brush Machine Co. has been incorporated with $25,000 capital by John Dostal, Harry Worshill, and Henry Kirchner.

PRAIRIE DU CHIEN, WIS.—The Prairie du Chien & Wyalusing Bridge Co., capital stock, $50,000, has been organized by local capital, headed by J. S. Earll, to build a bridge across Wisconsin river.

RACINE, WIS.—Plans have been completed for a 4-story brick and concrete factory addition, 80 x 200 feet, for the Belle City Mfg. Co., agricultural implements, at Racine Junction.

RACINE, WIS.—The Racine Motor Truck Co. has been incorporated with a capital of $50,000 to manufacture motor trucks; by Ira L. Miller, B. F. Henline, et al.

RACINE, WIS.—The F. J. Greene Engineering Co. has been awarded the contract for the steel work on a $30,000 power house addition at the station of the Milwaukee Electric Railway & Light Co.

SEYMOUR, WIS.—Articles of incorporation have been filed by the Seymour Electric Co., capital stock, $10,000, to build, maintain and operate a commercial light and power plant. The incorporators are S. D. Newell, W. E. and E. P. Daniells.

SHAWANO, WIS.—Supt. C. Capraro of the electric light and water plant has asked the common council to build a power house addition and install a new 250 horsepower corliss engine, with direct-connected generator, and a set of motor-driven pumps.

STEVENS POINT, WIS.—A 2-story brick factory addition, 30 x 100 feet, will be erected by the C. J. Frost Co. The general contract has been awarded to Charles Packard.

DETROIT.—The Ireland & Matthews Mfg. Co. has made application for a permit to erect a 2-story foundry building, to cost about $20,000.

DETROIT.—The Detroit Brass Works will build a 5-story factory and foundry.

DETROIT.—Dodge Bros. are having plans drawn for a 7-story warehouse, 167 x 272 feet. Smith, Hinchman & Grylls are the architects.

DETROIT. — The Paragon Chemical Co. has been chartered with $100,000 capital, by David Pringle, John P. Robertson and Elmer W. Mulford.

DETROIT.—The Doble-Detroit Steam Motor Co. has been organized with $10,000,000 capital and will acquire existing plants for immediate operation.

DETROIT.—The Progress Auto Equipment Co. has been incorporated with $50,000 capital, to manufacture auto parts, by Herman A. Schmidt, Karl Torge and O. H. Schnepper.

DETROIT.—The Murphy Engineering Co., capital $20,000, has been chartered to make machinery and equipment, by Peter W. Murphy, John Peplinski, Peter and A. E. Riedel.

GRAND HAVEN, MICH.—The Challenge Machinery Co. has commenced work on a foundry addition 100 x 170 feet.

GRAND RAPIDS, MICH. — Wilmarth & Norman soon will commence work on a 1-story, 76 x 84-foot factory building, to cost about $35,000.

GRAND RAPIDS, MICH. — The Samson Trailer Corporation has been incorporated with $150,000 capital, to manufacture motor vehicles, by Edgar T. Towar, C. A. Bray and M. D. Smith.

KALAMAZOO, MICH. — The Fuller & Sons Mfg. Co. soon will erect a 78 x 122-foot, 1-story building, to be used for heat treatment. An expenditure of $25,000 is involved.

THREE RIVERS, MICH. — The Sheffield Car Co. has awarded a contract for a 1-story, 50 x 150-foot building, to cost $40,000.

BLOOMINGTON, ILL.—The Joliet Mfg. Co., manufacturer of agricultural implements, will build a 4-story factory to cost $25,000.

CHICAGO.—The Standard Spiral Pipe Co. has been damaged by fire. A loss of $200,000 was entailed.

CHICAGO. — Fred A. Hart & Co. will erect a 2-story, 48 x 80-foot factory building, to cost about $20,000.

CHICAGO. — C. H. Hansen, 178 North Clark street, has plans for a 3-story $25,000 factory addition, 50 x 100 feet.

CHICAGO. — The Chicago Brass Works, 220 West Ohio street, has been incorporated with $10,000 capital by P. S., J. E. and M. C. Kelly.

CHICAGO.—The Marine Safety Appliance Corporation has been chartered with $1,000,-

Firms Move Offices

The Union Drawn Steel Co., Beaver Falls, Pa., has removed its Detroit warehouse to 69 Joseph Campau avenue, Detroit, in order to enable it to carry a more complete stock of cold-drawn steel.

Scully, Jones & Co., engineering supplies, have removed to suite 557 Railway Exchange building, Chicago; larger offices in the same building.

T. P. Kelly & Co., New York, have moved into their new building at 335 West Twenty-sixth street, where a complete line of foundry facings and supplies are carried in conjunction with their graphite products.

The Ashton Valve Co., Cambridge, Mass., has discontinued its Boston office and is handling all its business at the Cambridge works.

The Wisconsin Bridge & Iron Co., North Milwaukee, Wis., has removed its contracting and engineering offices from 605 Colby-Abbot building, Milwaukee, to the plant at North Milwaukee.

Gaston, Williams & Wigmore, Inc., have moved into larger quarters in the Equitable building, 120 Broadway, New York.

The offices of the United Engineering & Foundry Co., at the Lloyd Booth plant, Youngstown, O., have been transferred to the office building of the William Tod Co., a subsidiary, where all the Youngstown business of the United company will be transacted.

000 capital, in Delaware, by F. J. Petrovices, F. A. Helfinger and C. Wilde.

CHICAGO.—The Turner Mfg. Co., August Turner, president, is ready for bids on three 3-story manufacturing buildings, 80 x 250 feet, 110 x 144 feet and 50 x 68 feet.

CHICAGO.—The Metallurgical Laboratories, Inc., has been organized with $10,000 capital. William R. Dickinson, Edwin L. Johnson and William B. McIlvaine, are the incorporators.

CHICAGO.—The Lamson Truck & Tractor Co. has been incorporated in Delaware with $2,000,000 capital to manufacture tractors and trucks by B. R. Hoffman, E. J. Perkins and G. D. Harris.

CHICAGO.—The Grant Wire Wheel Mfg. Co. has obtained a Delaware charter with $250,000 capital to manufacture wire wheels and automobile parts, by H. Lewis, C. W. Shaeffer, and J. G. Burris.

CICERO, ILL.—The Cullen, Firestedt Co., contemplates a 1-story machine shop and storage building.

MOLINE, ILL.—The Reynolds Engineering Co. has been organized with $15,000 capital, to make machinery, tools and engines, by J. P. Reynolds, C. P. Lowery, Kenneth D. Tilton and Harold Brown.

ROCK FALLS, ILL.—The Russell, Birdsall & Ward Co., manufacturer of bolts and nuts, has bought a site and will build an addition.

ROCKFORD, ILL.—The Sunstrand Mfg. Co. has been incorporated with $25,000 capital, by Gustaf D. Sundstrand, C. Adolph Sunstrand and Oscar J. Sunstrand.

ATTICA, IND. — The Broscher Kenlay Twentieth Century Injector & Supply Co. will build a gray iron foundry and other additions.

ELWOOD, IND. — The McClintock Mfg. Co. has been chartered with $10,000 capital, to make machinery, by Michael Meyer, Joe G. Fields and Daniel T. Jenner.

FRANKLIN, IND. — The Franklin Mfg. Co., manufacturer of tractors, will build a three-story factory.

HUNTINGTON, IND. — The Huntington Steel Foundry Co. has commenced work on a 2-story, 40 x 80-foot addition to its plant.

MARTINSVILLE, IND. — The municipal power house and pumping station was damaged by fire, recently, to the extent of $25,000.

CLEVELAND.—The Cleveland Welding & Mfg. Co. will erect a $40,000, 1-story factory building.

CLEVELAND. — Application for a permit has been made for an $80,000 factory building, 145 x 338 feet, to be built for C. Greve.

CLEVELAND. — The Peerless Motor Car Co. soon will be ready for bids for a storage building to be located on their present site.

CLEVELAND.—R. J. Chapelle has awarded a contract to C. W. Griffen, 3111 Carnegie avenue, for a 3-story, 40 x 40-foot warehouse.

CLEVELAND. — The Blomquist-Eck Machinery & Mfg. Co. has purchased a site and will soon commence construction work on a factory building.

CLEVELAND.—The Nickel Plate railroad has made application for plans to erect two freight houses, 78 x 433 feet and 48 x 72 feet, to cost $60,000 and $45,000, respectively.

CLEVELAND.—The Cuyahoga Machine & Tool Co. has been chartered with $10,000 capital, by J. C. Weisenbach, J. Moosa, F. J. Runser, H. L. Morunga and Otto C. Morunga.

COLUMBUS, O.—The Columbus Malleable Iron Co. has commenced construction work on a $10,000 addition.

COLUMBUS, O.—The Cleveland & Mahoning Valley railroad has asked the state for permission to issue $2,851,000 of bonds, for improvements.

DAYTON, O.—The Standard Machine & Tool Co. has been capitalized at $25,000, by James Saunders, George E. Callaher, Joseph Sheridan, I. I. Hauer and V. A. Troxell.

LIMA, O.—The C. H. & D. railroad has let a contract for the erection of a paint shop, 26 x 280 feet. The structure will cost about $80,000.

MASSILLON, O. — The Christman-Stoner Mining Co. has been incorporated with $30,000 capital, by Edward Christman, et al.

MIDDLETOWN, O.—The Enterprise Machine Co. has been incorporated with $75,000 capital, by Colin Gardner and others.

MIDDLETOWN, O.—The United Chemical & Refining Co., L. M. Rader, president, Chicago, capitalized at $500,000, may locate here.

NORTH RIDGEVILLE, O.—The Schwartz-Van Wormer Co. has been incorporated with $25,000 capital to make machinery and tools, by Martin Schwartz, L. N. Van Wormer, W. A. Schmittgen, R. Van Wormer and Nelson Van Wormer.

WARREN, O.—The Warren Metal Co. has been chartered with $50,000 capital, by Roy Knofsky, Jacob Knofsky, Isador Knofsky and Floyd S. Williams.

ADAIRVILLE, KY.—The Adairville Lighting Co., recently incorporated, will equip its light and power plant with oil engines. Transmission equipment, etc., will be purchased.

LOUISVILLE.—Kentucky Utilities Co. will purchase the franchise to supply light and power in LaGrange, Ky.

LOUISVILLE, KY. — The Louisville Car & Foundry Co. has increased its capital to $60,000 and bought the plant of the Gateway Car Co., to which additions will be made.

PADUCAH, KY.—The Illinois Central railroad will install additional machinery costing $60,000 in its shops. A. S. Baldwin, Chicago, is chief engineer.

MORGANTOWN, W. VA.—Bids are being received by the Rosedale Coal Co., C. I. Lantz manager, for mining equipment.

PARKERSBURG, W. VA.—The board of education plans to erect a school building, to cost $175,000. F. L. Packard, New Hayden building, Columbus, O., is preparing plans.

WHEELING, W. VA.—The Vulcan Iron & Steel Co. has been chartered with $300,000 by Thomas Watson, George R. Wallace, E. B. Power, D. B. McConaughy and Walter B. Eichleay.

Mississippi to the Rockies

MINNEAPOLIS. — The United Chemical Industry Co. has plans in preparation for a $50,000 factory.

ST. PAUL, MINN.—The St. Paul Foundry Co., John Allenson, superintendent, soon will commences work on a 2-story building to cost about $12,000.

ST. PAUL.—The Northwestern Telephone Exchange Co., John C. Hardy, superintendent, will be ready for bids soon, on a 3-story, 30 x 100-foot addition, to cost about $135,000.

CEDAR RAPIDS, IA.—The Leonard Hi-Oven Range Co. has awarded a contract to A. J. Smith for a 1-story factory building, 50 x 110 feet.

DES MOINES, IA.—The Carpenter Paper Co. has let a contract to Charles Weitz Sons, for a 4-story, $60,000 factory building, 80 x 132 feet.

OTTUMWA, IA. — The Ottumwa Iron Works has let a contract to the Ottumwa Mill Construction Co. for a 1-story foundry building, to cost about $5,000.

KANSAS CITY.—The Kansas City Home Telephone Co., care C. J. Meyers, plans to erect a 50 x 150-foot exchange building, to cost about $100,000.

KANSAS CITY.—The Chicago, Burlington & Quincy railroad, Hale Holden, president, 547 West Jackson boulevard, Chicago, requests bids on a 1-story freight house, 32 x 506 feet.

MACON, MO.—Fire damaged the Wabash passenger station and the Macon Motor Co., entailing a loss of $500,000.

SPRINGIELD, MO. — The United Iron Works has been let a contract by the Sinclair Pipeline Co., Tulsa, Okla., to furnish $20,000 worth of tanks and equipment.

ST. LOUIS.—The Wagner Electric Co. soon will begin work on a 1-story, 36 x 100-foot factory building.

ST. LOUIS.—The Concrete Steel Fireproofing Co. has been incorporated with $65,000 capital, by Edward C. Marqua, Franklin D. Hopper, William J. Morse, J. D. Granville and J. T. McNulty.

BEAUMONT, TEX.—Permission has been granted the Kansas City Southern railroad to construct a 9-mile spur track, from Griffing to the Henning & Gilbert property.

CHILDRESS, TEX.—The Huggins-Andrews Co. has been incorporated with $24,000 capital, by J. W. Huggins, W. R. Andrews and S. H. Huggins.

DALLAS, TEX.—The Peavey Rubber Co. has been incorporated with $100,000 capital, by Ralph A. Peavey, N. P. Deavours and F. W. Ware.

HOUSTON, TEX. — The Texas Chemical Co. has been chartered with $100,000 capital, by George P. Howard, E. W. Townes and S. Peiser, of San Francisco, Cal.

FORT WORTH, TEX.—The Pierce-Fordyce Oil Association has commenced work on a 100-mile pipe line to Healdton, Okla.

SAPULPA, OKLA.—L. O. Lytle, of the Creek Construction Co. has secured a contract to build eleven miles of railroad, between Dallas and Iwin, Tex.

WICHITA, KAN.—The Kansas City Gas & Electric Co., H. P. Wright, president, will erect two 55,000-gallon oil tanks. An expenditure of $75,000 is involved.

BOWDOIN, MONT.—The Great Northern railroad has awarded a contract for a $300,000 engine terminal to Grant, Smith & Co., Pioneer building, St. Paul.

HELENA, MONT.—O. G. Fisher, L. P. Benedict et al, of Butte, have formed a $1,000,000 corporation to build a railroad from Divide in Silver Bow county, to Wisdom and Ralston.

Iron and Steel Prices

Corrected to Tuesday noon

IRON ORE

Lake Superior Ores. Lower Lake Ports.

Old range Bessemer, 55 per cent, ton	5.95
Mesabi Bessemer, 55 per cent, ton	5.70
Old range non-Bess., 51½ per cent, ton	5.20
Mesabi non-Bess., 51½ per cent, ton	5.05

Port Henry Ores. Per unit delivered eastern Pa. All non-Bessemer.

Old Bed, crude, 58 per cent.	10.50c to 11.00c
Old Bed, concent., 65 per cent	11.00c to 11.50c
Harmony concent., 63 per cent	11.50c to 11.75c
Lump (at mines)	$5.75

WAREHOUSE PRICES

Steel bars, Chicago	4.50c
Steel bars, Cleveland	4.50c
Steel bars, Detroit	4.50c
Steel bars, Philadelphia	5.00c
Steel bars, New York	4.75c
Steel bars, St. Louis	4.55c
Steel bars, Cincinnati	4.65c
Steel bars, St. Paul	4.60c
Steel bars, over 2-in., Buffalo	**4.50c**
Steel bars, Buffalo	**4.40c**
Iron bars, Chicago	4.50c
Iron bars, Cleveland	4.45c
Iron bars, Detroit	**4.00c**
Iron bars, St. Louis	4.45c
Iron bars, Cincinnati	4.65c
Iron bars, Philadelphia	4.50c
Iron bars, New York	4.50c
Shapes, Chicago	5.00c
Shapes, Detroit	5.00c
Shapes, St. Louis	5.05c
Shapes, St. Paul	5.10c
Shapes, New York	5.00c
Shapes, Cleveland	5.00c
Shapes, Philadelphia	4.75c to 5.00c
Shapes, Buffalo	**4.60c**
Shapes, Cincinnati	5.00c
Plates, Chicago	6.50c
Plates, Detroit	8.00c
Plates, St. Louis	6.55c
Plates, St. Paul	6.60c
Plates, New York	7.00c
Plates, Cleveland	7.50c
Plates, Philadelphia	7.00c
Plates, Cincinnati	7.00c
No. 10 blue anl. sheets, Chicago	7.50c
No. 10 blue anl. sheets, Clevel'd	7.75c
No. 10 blue anl. sheets, Buffalo	4.50c
No. 10 blue anl. sheets, St. L.	7.55c
No. 10 blue anl. sheets, Cincin.	7.50c
No. 10 blue anl. sheets, St. Paul	7.60c
No. 10 blue anl. sheets, Detroit	8.00c
No. 28 black sheets, Chicago	7.50c
No. 28 black sheets, Cleveland	8.25c
No. 28 black sheets, Cincinnati	7.50c
No. 28 black sheets, Detroit	8.00c
No. 28 black sheets, St. Louis	7.85c to 8.50c
No. 28 black sheets, St. Paul	7.60c
No. 28 galv. sheets, Chicago	9.50c
No. 28 galv. sheets, Cleveland	10.00c
No. 28 galv. sheets, Cincinnati	9.00c
No. 28 galv. sheets, Detroit	8.00c
No. 28 galv. sheets, St. Louis	11.00c
Hoops, Cleveland	6.00c
Hoops, Detroit	6.00c

IRON AND STEEL SCRAP

STEEL WORKS USE

(Gross Tons)

Bundled sheets, Pittsburgh	**$18.50 to 19.00**
Bundled sheets, Cleveland	18.25 to 19.00
Bundled sheets, Buffalo	16.50 to 17.00
City wrought, short, New York	22.00 to 23.00
Frogs, switches, guards, St. L.	30.50 to 31.00
Heavy melting steel, Pittsburgh	29.00 to 30.00
Heavy melting steel, Buffalo	28.00 to 29.00
Heavy melting steel, Chicago	32.50 to 33.00
Heavy melting steel, Cleveland	27.75 to 28.50
Heavy melting steel, Cincinnati	25.50 to 26.00
Heavy melting steel, eastern Pa.	25.00 to 26.00
Heavy melting steel, New York	25.00 to 26.00
Heavy melting steel, St. L.	31.50 to 32.50
Heavy melt'g steel, Birmingham	19.00 to 20.00
Hydraulic pressed sheets, Cleve.	21.50 to 22.00
Hydraulic pressed sheets, Pitts.	23.50 to 24.00
Hydraulic pressed sheets, Chgo.	23.00 to 24.00
Low phos. steel, Buffalo	36.00 to 38.00
Low phos. steel, Pittsburgh	37.00 to 38.00
Low phos. steel, eastern Pa.	38.00 to 40.00
Shoveling steel, Chicago	30.00 to 31.00
Shoveling steel, St. Louis	29.00 to 30.00
Steel rails, short, Chicago	38.75 to 39.75
Steel rails, short, Cleveland	32.50 to 33.00
Steel rails, short, St. Louis	38.00 to 39.00
Steel rails, old, Birmingham	**22.50 to 23.50**
Stove plate, Cleveland	**16.00 to 16.50**
Stove plate, Cincinnati	14.75 to 15.25
Stove plate, St. Louis	15.00 to 15.50
Stove plate, N. J. points	17.00 to 17.50
Stove plate, Birmingham	**13.50 to 14.50**
Stove plate, Buffalo	**18.00 to 18.50**
Stove plate, eastern Pa.	**19.00 to 19.50**
Stove plate, Pittsburgh	**16.00 to 17.00**

(Net Tons)

Boiler plate, cut, No. 1, Chicago	21.50 to 22.00
Boiler plate, cut, No. 1, St. L.	18.50 to 19.00
Bundled sheet, Cincinnati	15.75 to 16.25
Knuckles, coup., Chicago	35.50 to 36.00
Knuckles, coup., St. Louis	30.00 to 31.00
Springs, Chicago	37.00 to 37.50
Stove plate, Chicago	18.50 to 19.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	**4.54**

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (r. and w.)	4.25
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
St. Louis	3.40

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54

Duluth, Minn., to:—

Minneapolis-St. Paul	$1.25

Mayville, Wis:—

Minneapolis-St. Paul	$1.75

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs. to:—

New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.0 cents

IRON MILL USE

(Gross Tons)

Busheling No. 1, Buffalo	23.00 to 23.50
Busheling, No. 2, Buffalo	14.00 to 14.50
Busheling, No. 1, Pittsburgh	20.00 to 21.00
Cast borings, New York	13.50 to 14.00
Cast borings, eastern Pa.	16.00 to 16.50
Cast borings, Buffalo	14.50 to 15.00
Cast borings, Pittsburgh	15.50 to 15.75
City wrought, long, New York	32.50 to 33.00
Forge flash'gs, un. 10 in., Cleve.	23.00 to 24.00
Forge flash'gs, ov. 10 in., Cleve.	22.00 to 23.00
Forge, No. 1, eastern Pa.	19.00 to 19.50
Grate bars, Buffalo	18.00 to 18.50
Grate bars, N. J. points	17.00 to 17.50
Iron axles, Pittsburgh	**49.00 to 50.00**
Iron axles, Cincinnati	**44.00 to 45.00**
Iron axles, eastern Pa.	40.00 to 42.00
Iron axles, Buffalo	45.00
Iron rails, Chicago	37.00 to 37.50
Iron rails, Buffalo	29.50 to 30.00
Iron rails, Cincinnati	28.50 to 29.00
Iron rails, St. Louis	34.00 to 35.00
Iron rails, Cleveland	33.00 to 34.00
Machine shop turnings, Buffalo	13.00 to 13.50
Mch. shop turnings, New York	13.50 to 14.00
Mach. shop turnings, Pittsburgh	15.00 to 15.50
Mch. shop turnings, eastern Pa.	15.50 to 16.00
Mch. shop turnings, Birmingham	8.50 to 9.50
R. R. and mch. cast, No. 1, Bfl.	26.00 to 26.50
R. R. wrought, No. 1, Buffalo	37.00 to 38.00
R. R. wrgt., No. 1, eastern Pa.	41.00 to 43.00
R. R. wrought, No. 1, Pittsburgh	36.00 to 37.00
R. R. wrought, No. 1, B'ham	25.00 to 26.00
Wrought pipe, Buffalo	17.00 to 17.50
Wrought pipe, eastern Pa.	23.50 to 24.50
Wrought pipe, New York	22.00 to 22.50

(Net Tons)

Angle bars, Iron, Chicago	$37.50 to 38.00
Angle bars, steel, St. Louis	28.00 to 28.50
Arch bars and transoms, St. L.	38.00 to 38.50
Arch bars and transoms, Chgo.	39.50 to 40.00
Busheling, No. 1, Chicago	24.50 to 25.50
Busheling, No. 1, Cincinnati	17.50 to 18.00
Busheling, No. 1, Cleveland	**20.00 to 20.50**
Busheling, No. 1, St. Louis	23.00 to 23.50
Busheling, No. 2, Chicago	18.00 to 18.50
Cast borings, Cincinnati	10.25 to 10.75
Cast borings, Cleveland	**12.00 to 12.25**
Cast borings, St. Louis	14.00 to 14.50
Cast borings, Chicago	14.50 to 15.00
Cut forge, Chicago	33.50 to 34.00
Grate bars, Cleveland	16.00 to 16.50
Iron axles, St. Louis	42.00 to 43.00
Iron axles, Chicago	45.00 to 45.50
Iron axles, Cleveland	**45.00 to 46.00**
Machine shop turnings, Chicago	15.00 to 15.50
Mach. shop turnings, Cleveland	11.25 to 11.75
Machine shop turn'gs, Cincinnati	10.25 to 10.75
Mach. shop turnings, St. Louis	15.50 to 16.50
Pipes and flues, Cleveland	20.00 to 21.00
Pipes and flues, Chicago	22.75 to 23.25
Pipes and flues, St. Louis	19.75 to 20.25
Railroad wrought, No. 1, Cleve.	32.00 to 33.00
Railroad wrought, No. 1, Chgo.	36.50 to 37.00
Railroad wrought, No. 1, Cinci.	23.50 to 24.50
Railroad wrought, No. 1, St. L.	33.00 to 34.00
Railroad wrought, No. 2, Chgo.	33.50 to 34.00
Railroad wrought, No. 2 St. L.	31.00 to 32.00

IRON OR STEEL WORKS USE

(Gross Tons)

Axle turnings, Cleveland	$17.50 to 18.00
Axle turnings, Buffalo	19.50 to 20.00
Shafting, New York	35.00 to 36.00
Shafting, eastern Pa.	36.00 to 37.00
Steel car axles Birmingham	**35.00 to 36.00**
Steel car axles, New York	47.00 to 48.00
Steel car axles, Buffalo	**45.00**
Steel car axles, Cleveland	45.00 to 46.00
Steel car axles, Pittsburgh	**49.00 to 50.00**
Steel car axles, eastern Pa.	**41.00 to 43.00**

(Net Tons)

Shafting, St. Louis	28.50 to 29.00
Steel car axles, St. Louis	42.50 to 43.50
Steel car axles, Chicago	44.00 to 45.00

IRON FOUNDRY USE

(Gross Tons)

Car wheels, (iron), Pittsburgh	31.00 to 31.50
Car wheels, (steel), Pittsburgh	33.00 to 34.00
Car wheels, Chicago	34.50 to 35.50
Car wheels, eastern Pa.	29.00 to 30.00
Car wheels, Buffalo	26.50 to 27.50
Car wheels, New York	26.50 to 27.00
Car wheels, St. Louis	27.00 to 28.00
Car wheels, Birmingham	22.00 to 23.00
Car wheels, Cleveland	24.50 to 25.00
Cast, No. 1, heavy, N. J. points	26.00 to 27.00
Cast, No. 1 machy. N. J. joints	29.50 to 30.50
Cast, No. 1, eastern Pa.	30.00 to 31.00
Cast, No. 1, Pittsburgh	26.00 to 27.00
Cast, No. 1, Cleveland	23.25 to 23.50
Cast, No. 1, Birmingham	22.00 to 23.00
Malleable railroad, Cincinnati	17.00 to 17.50
Malleable railroad, Cleveland	25.25 to 26.00
Malleable railroad, Buffalo	27.50 to 28.50
Malleable railroad, Pittsburgh	26.00 to 28.00
Malleable railroad, eastern Pa.	29.00 to 30.00
Tram car wheels, Birmingham	20.50 to 21.50

(Net Tons)

Cast, No. 1, Chicago	26.50 to 27.00
Cast, No. 1, Cincinnati	21.75 to 22.25
Cast, No. 1, St. Louis	24.00 to 25.00
Malleable railroad Chicago	27.50 to 28.00
Malleable railroad, St. Louis	22.50 to 23.00
Malleable agricultural, Chicago	22.50 to 23.00

MISCELLANEOUS USES

(Gross Tons)

Reroll. rails, 5 ft. & ov., Pitts.	34.00 to 35.00
Reroll. rails, 5 ft. & ov., Chgo.	41.50 to 42.00
Reroll. rails, 5 ft. & ov., E. Pa.	34.00 to 35.00
Reroll. rails, 5 ft. & ov., St. L.	39.00 to 40.00
Reroll. rails, 5 ft. or ov., Cleve.	36.75 to 37.50
Reroll. rails, 5 ft. or ov., Birm.	**30.00 to 31.00**

(Net Tons)

Boiler punchings, Chicago	29.50 to 30.00
Locomotive tires, Chicago	44.50 to 45.00
Locomotive tires, St. Louis	41.00 to 42.00